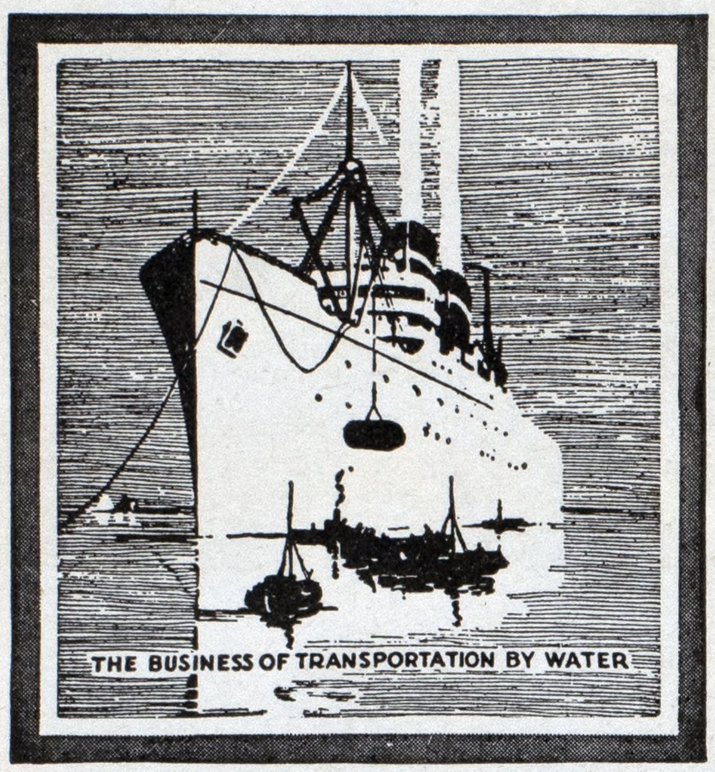
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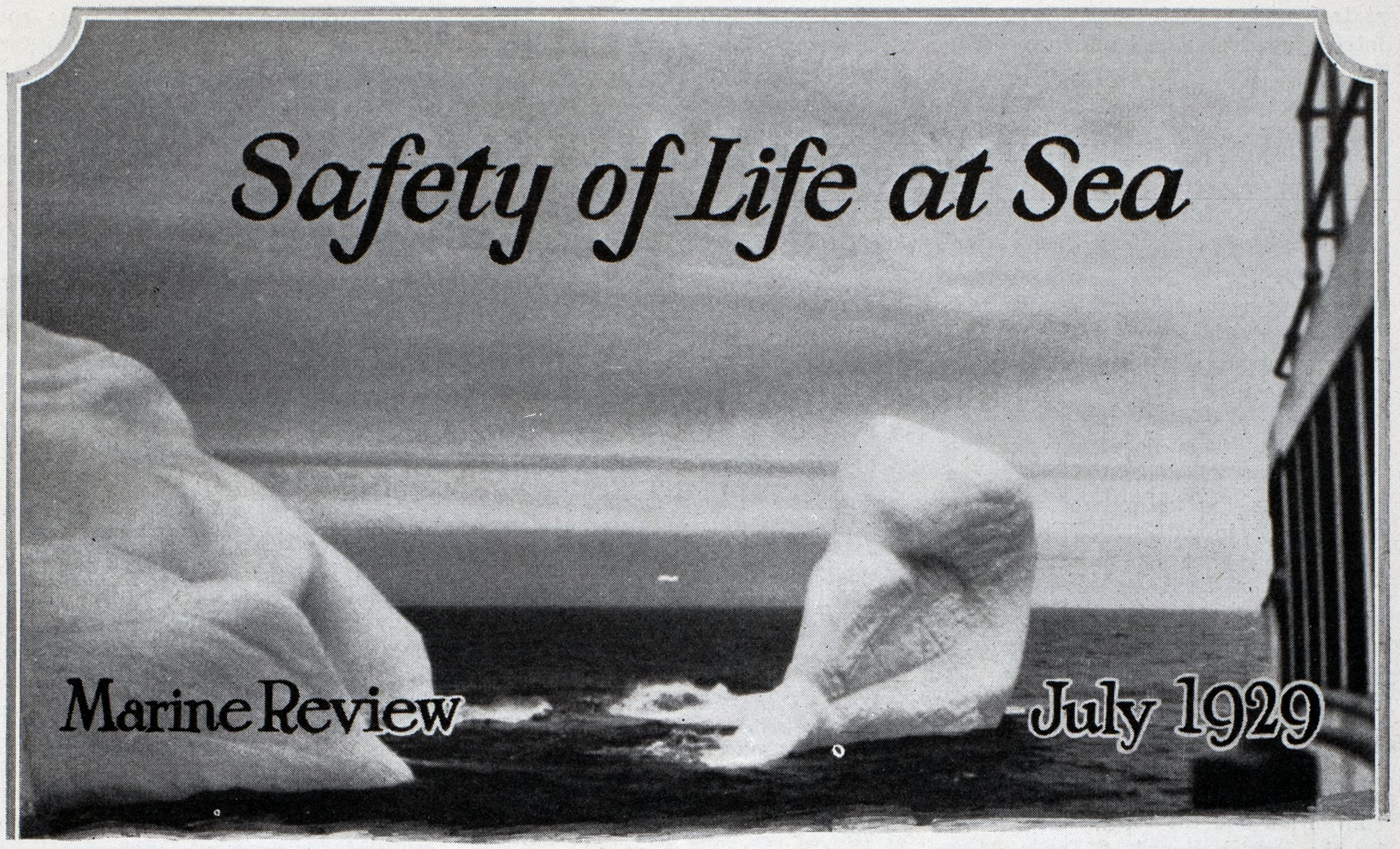
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International Ice Patrol Conducted by the United States Coast Guard Gives Warning to All of Iceberg Danger

International Conference of 1929

Agrees on All Measures to Increase Safety

THAT the seas do not separate the nations of the world but rather tie them together in bonds of mutual respect and good will was demonstrated by the success of the International Conference on Safety of Life at Sea in which every nation represented, agreed on every measure adopted to further secure life and property afloat. The conference met at London and the first meeting was held on April 16. The final meeting was held May 31, at the foreign office when the convention representing the results of the labor of the delegates, and which had been unanimously approved, was signed by delegates representing Australia, Belgium, Canada, Denmark, Finland, France, Germany, and Irish Free State, Italy, India, Netherlands, Japan, Norway, Spain, Sweden, Union of Socialists Soviet Republics, United Kingdom and the United States of America.

Specific terms of the convention in detail are not available at the time this is written but it can be said that never before in history has so much good been accomplished for the advance of shipping. The highest practical standards were set for the design, construction and operation of ships not only so that each individual ship might have a maximum degree of safety but also so that each ship sailing the seas would be in a position to render efficient aid to any other ship within reach that might be in distress.

At the final session on May 31, Vice Admiral Sir Herbert Richmond, K.C.B., president of the conference, presented an interesting summary of the results, on which the following remarks are based. The first International Conference on Safety of Life at Sea convened in London in 1913 and completed its work in January 1914. The convention incorporating the rules and regulations agreed upon at that time was unanimously adopted and signed by representatives of Germany, Austria, Belgium, Denmark, Spain, United States, France, Great Britain, Italy, Norway, the Netherlands, Russia and Sweden. Some, but not all of the powers whose representatives signed this convention, ratified it and owing to the war it was not brought into force fully by any country. Parts of it were put in operation by individual

states under their own law. An international standard affecting safety for ocean going passenger ships had therefore been set up more than fifteen years ago. In the meantime progress has been made in the design and construction of passenger ships and much additional experience has been gained by all the nations.

In 1927 the British Board of Trade presented to the other nations, who had signed the convention of 1914, a memorandum showing in detail the work done in Great Britain since this time on the subjects covered by the convention. This document was put forward for consideration as a preliminary to the holding of a similar conference in 1929. The British pointed out that as these proposals "were based on technical considerations only, which are the same for all ships of the same class, whatever flag they fly, they should, if they are well founded provide at any rate an adequate basis for the discussion."

Following this all of the maritime nations studied the terms of the 1914 convention and the suggestions offered by the British Board of Trade. Consequently when the present conference of 1929 met it had the benefit of a great deal of valuable information gained from actual experience on ships of all nations during the past fifteen years.

Detailed examination of the problems before the present conference was divided up among five committees and a chairman appointed for each committee as follows: 1. Construction, Rear Admiral George H. Rock, United States. 2. Life Saving Appliances, Sir Norman Hill, United Kingdom. 3. Radio Telegraphy, M. Giess, Germany. 4. Safety of Navigation, Sir Charles Hipwood, Great Britain. 5. Certificates, General Marena, Italy. Sub-committees were also appointed on; General Provisions, headed by Sir Charles Hipwood and Drafting, by Senator Rio, France. Four of the main committees subdivided the work among smaller committees and active work was commenced and continued throughout the session, the work of the sub-committees being examined, reviewed and reported upon by each of the main committees. The final reports of the main committees were again reviewed and coordinated by the Drafting committee which presented the final form of the new convention, which from July 1, 1931, is to take the place of the convention of 1914. It was so unanimously agreed by all the representatives present.

Practical Safety Rules

COMPLETE agreement on the entire convention which represents the results of six weeks of intensive labor on the part of delegates and technical assistants from 18 nations at the International Conference on the Safety of Life at Sea held at London and which concluded its sessions May 31 is indicative of the practical quality of the measures adopted. Impractical features which would tend to throttle the industry had no chance of acceptance. At the same time the delegates from every nation were actuated by the highest motives and a desire to work out simple, practical, clear rules and regulations based on experience and the use of every advance in science to the end that the already wonderful record of safety of life at sea may be improved.

Features of Construction

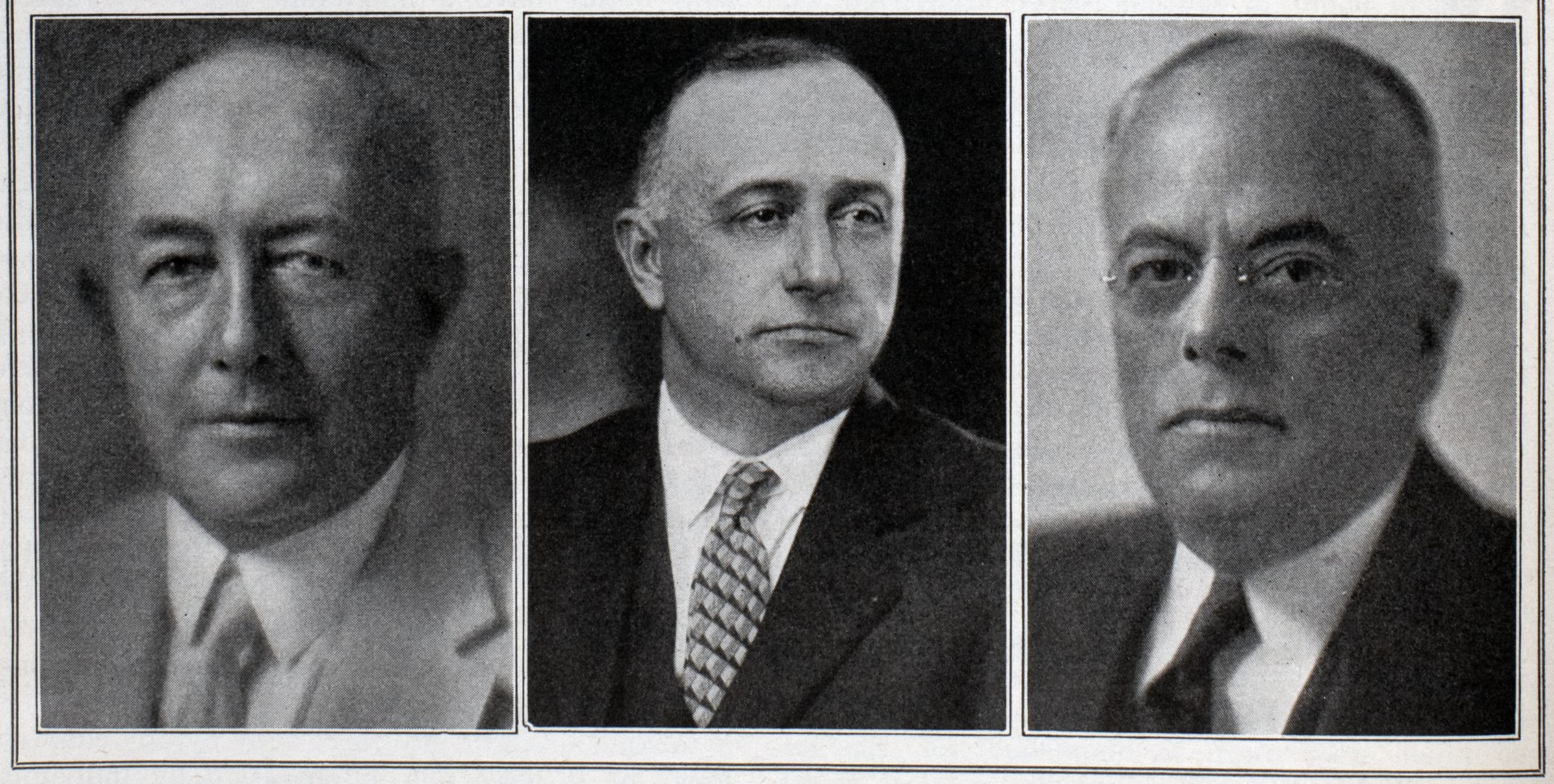
THREE broad principles were laid down at the conference of 1914 for considering the methods by which, after the hull has been penetrated, the flow of water can be controlled or retarded. These principles which are as follows were reaffirmed and approved.

1. Ships shall be as efficiently subdivided as is possible having regard to the nature of the service for which they are intended.

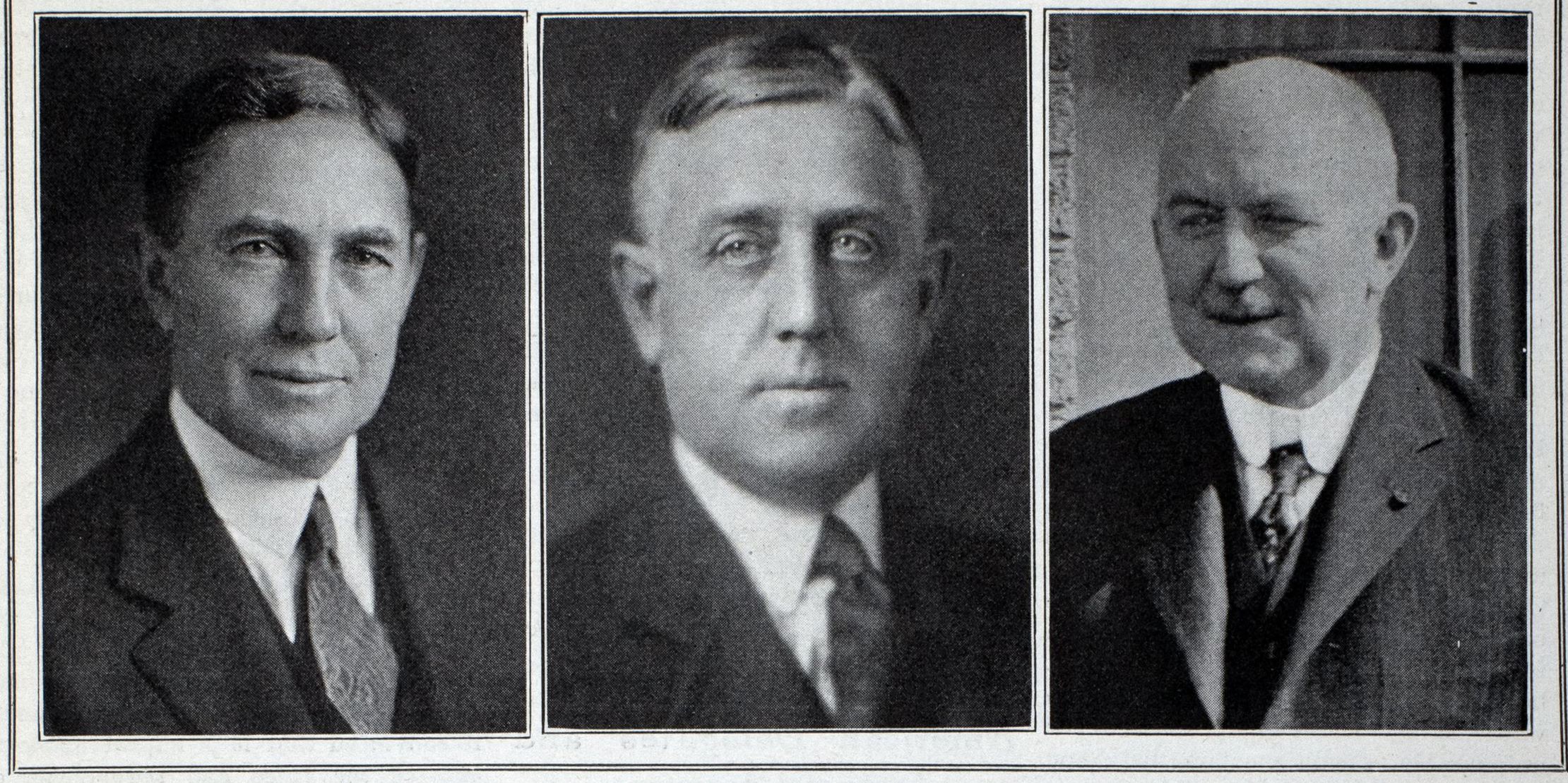
2. The degree of subdivision should vary in regular manner with the length and the service of the vessel.

3. The highest degree of subdivision should be associated with vessels which are primarily engaged in the carriage of passengers and with vessels of the greatest length.

The standard of subdivision adopted in 1914 for vessels of different length primarily engaged in the carriage of passengers required that they should be able to float with any one compartment open to the sea when the vessel's length is about 260 feet. A gradual increase in subdivision was called for in proportion to the length so that a vessel of about 500 feet was required to float with any two adjacent compartments flooded or in effect when any one bulkhead in the ship has been damaged. At about 900 feet



American Delegates to the Conference. Left to Right, Arthur J. Tyrer, Dickerson N. Hoover and H. B. Walker



American Delegates to the Conference. Left to Right, H. G. Smith, Wallace H. White, Chairman, and Capt. Chas. A. McAllister

in length, subdivision was called for so that the vessel would be likely to float with any three adjacent compartments open to the sea and still be safe.

The present conference while adjusting the relation of subdivision to length found this standard reasonable for passenger vessels. The standard of the 1914 convention, however, for ships carrying moderate numbers of passengers was found to be too severe and a new standard for this type of vessel, carrying say from 12 to 15 passengers, had been set up as a result of informal consultations between the principal maritime countries of the world. This provisional standard for vessels principally engaged in the carrying of cargo and only carrying a small number of passengers received the approval of the present conference. What is called a "criterion of service" had been suggested to show how far a vessel departed from being a cargo ship and became a passenger ship. Subdivision was to be increased over that required for a cargo ship and up to that required for a passenger ship according to the position of the vessel in question, measured by this "criterion of service." The conference approved this means of determining the extent of subdivision, and in applying the complete scheme it adjusted its requirements so that the numbers and spacing of bulkheads applied to all sea going passenger ships which during international voyages are more than 20 miles from the nearest coastline.

This represents a substantial improvement over the somewhat arduous interpretation of the rule approved in 1914.

Stability Must Be Ascertained

THE conference made it a definite requirement that the necessary information as to stability for all new passenger ships shall be supplied to the master of the ship. The number of openings for doors in bulkheads is restricted to a minimum required for the proper operation of vessels under ordinary sea going conditions. Special emphasis was placed on the importance of making certain that any openings for doors and bulkheads are properly safeguarded, so that in an emergency the machinery for closing such doors can readily be used.

The question of openings in the sides and deck of the vessel was carefully examined and the conference came to the conclusion that full advantage should be taken of all modern developments. Regulations were approved with reference to piping arrangements in the ship which should reduce the chances of undamaged compartments being accidentally flooded through minor mishaps to pipes and pumps.

Bulkheads are to be fitted designed to limit the spread of fire. Regulations were approved in detail for the inspection of the vessel, its fittings and machinery when new and also during each succeeding twelve months of its life.

Every Ship a Life Boat

ONE of the major by-products of the International conference on the Safety of Life at Sea was the firm conviction every delegate carried home of the essential solidarity of all nationals in peaceful trade upon the seas. Their problems and difficulties are the same and so are their interests. On the sea it is all for one and every delegate agreed to the rule that every ocean going vessel over a minimum size should henceforth carry radio receiving and communicating apparatus not only for its own safety but so that when occasion demands it may serve as a "life boat" in aiding others in distress. The kinship of the sea, among all the nations, was strengthened at the conference by the community of interest and the spirit of good will which prevailed.

Life Saving Gear

THE provisions of the convention of 1914 requiring boats for all on ocean going passenger ships was put into effect by practically every nation. But experience since 1914 has demonstrated the urgent necessity that such life boats be ready for launching. Losses that occurred since 1914 make it clear that even on vessels of the highest class and of great size the time in which life boats must be gotten out is limited even to so little as fifteen to twenty minutes. The shortness of time in which the operation of launching must be carried out has an effect on the type of boat to be used. Life boats developed as a result of the convention of 1914 have proved suitable for the purpose of carrying a large number of passengers. But they are heavy sea going craft and unless they are car-

ried directly under davits it is doubtful that they can be gotten away from the ship in time. Boats carried elsewhere than under davits on ships which have taken a heavy list before going down, have seriously hindered the work of getting passengers afloat in those boats that were available. Experience has also shown that it is important, in ships carrying a large number of passengers, to distribute the life boats over the greatest possible length of the ship.

In the light of experience since the 1914 conference the rule then made of boats for all was reaffirmed by the present conference, but in addition the importance of ready availability was recognized by providing that, "the life boats and buoyant apparatus must comply with the following conditions; (a). they must be capable of being got into the water safely and rapidly even under unfavorable conditions of list and trim; (b). it must be possible to embark the passengers in the boats rapidly and in good order; (c). the arrangement of each boat and article of buoyant apparatus must be such that it will not interfere with the operation of other boats and buoyant apparatus." Regulations were worked out in detail and embodied in the convention covering the practical operation of these recommendations.

It was reaffirmed that on board every ocean going ship carrying passengers there must be enough men holding certificates showing that they are trained in the launching of life boats, the use of oars and the practical handling of the boats themselves. So that on passenger ships carrying a large number of boats all may be used to best advantage, one or more of such life boats is to be a motor life boat fitted with a wireless installation and searchlight. Any individual nation may substitute life rafts of an approved type for life boats carried inboard, but not for boats carried under the davits, if in the opinion of such a nation, rafts of this type will be, in the case of emergency, more readily available and otherwise more satisfactory than boats.

All ocean going passenger ships it was decided shall carry, over and above life preservers for all, additional light buoyant apparatus for 25 per cent the number of such persons. Light buoyant rafts easily man handled and thrown from the ship's deck have proved of great value where rapidity of the disaster has made it impossible to get away in boats.

It was found that special arrangements are necessary for passenger ships of restricted length engaged on short international voyages. On such ships it was decided that all the boats that can be made available are to be carried, together with the type of buoyant apparatus called for in the regulations, to provide for all on board. Further buoyant apparatus is to be provided on ships of this type sufficient for 10 per cent of the number of persons on board. All details with reference to types of davits launching devices, lifeboats and their equipment as worked out by the 1914 convention were carefully gone over and brought up to date.

Other Details of Construction

RULES were worked out controlling means of access to and escape from different compartments and decks, also how they should be lighted. Drills and musters of the crew and the distribution of duties are specified in regard to such operations for instance, as the closing of water tight doors, the equipment of boats and other life saving equipment, the launching of the boats, the mustering of passengers, and action to be taken in case of fire. The regulations state that in passenger ships engaged on voyages exceeding one week in length, practice musters of passengers shall be held at an early period of each voyage; members of the stewards department have special duties at a time of emergency including the warning of passengers, seeing that the passengers are assembled at appointed muster stations, and general direction and control of passengers from such station to the boats.

The new rules are strict in the matter of carrying dangerous goods in passenger ships. Definite provision is made for carrying fire extinguishing appliances. In ships burning oil the new rules call for the use of froth, foam, carbon dioxide, etc., for blanketing fires. All passenger ships are also required to carry an approved type of line throwing appliance in order to establish communication between ship and ship or between ship and shore.

In certain trades where large numbers of unberthed passengers are carried, for instance, as in the pilgrim trade, each nation may exempt its own ships from these requirements, if convinced that it is impracticable to enforce the rules and regulations of the convention. When this is done life saving appliances to the fullest extent which the circumstances of the trade permit must be fitted. The convention also requires that steps be taken to prepare general rules applicable to these special trades, in cooperation with such other nations as may be interested in carrying such passengers.

American Delegates and Technical Assistants

To International Conference on Safety at Sea, Convened at London April 16—May 31, 1929

Chairman

Hon. Wallace H. White, Member of Congress

Vice Chairman

Arthur J. Tyrer, Commissioner of Navigation

Delegates

Charles M. Barnes, State Department
Rear Admiral G. H. Rock, Construction Corp.
Capt. C. S. Kempff, Hydrographic, U. S. N.
D. N. Hoover, Supervising Inspector General, Steamboat Inspection Service

W. D. Terrell, Radio Division, Dept. of Commerce
H. B. Walker, American Steamship Owners' Association

H. G. Smith, National Council of American Shipbuilders

Capt. C. A. McAllister, American Bureau of Shipping

Technical Assistants

Lieut. Commander E. L. Cochrane, U. S. N.
J. C. Niedermair, Navy Department
J. F. Macmillan, American Steamship Owners' Association

David Arnott, American Bureau of Shipping
Capt. W. E. Griffith, United States Shipping Board

A. J. Smith, Marine Office of America
Capt. N. B. Nelson, Steamboat Inspection Service
Lieut. E. M. Webster, United States Coast Guard
Commander C. M. Austin, United States Navy
E. B. Calvert, United States Weather Bureau

Secretary to Delegation

Vinton Chapin, Foreign Service Officer

Radio Requirements

SINCE 1914 the great importance of radiotelegraphy in promoting safety of life at sea has been fully demonstrated. Even in 1914 many ships belonging to passenger carrying lines had been equipped with means of radio communication but this was not true of merchant ships generally. In this respect there has been a remarkable development in the last fifteen years so that out of 11,000 merchant ships and motor ships of 1600 tons gross and upward owned by the maritime countries of the world, no less than 10,000 are now so equipped.

Ocean going ships, both passenger and cargo, are now carrying wireless installation. It is not sufficient however, for life saving purposes that a ship in distress shall be able to send out calls for assistance. It is necessary to provide for the reception of such calls by other ships in a position to render aid. A great deal of time was devoted by the conference to the organization of "watch keeping" on all vessels carrying the equipment. The annual cost of present equipment, its maintenance and the services of an operator is estimated to be not less than $1500 per ship or a total of $15,000,000 for the 10,000 ships so equipped. If all of

these vessels are also to be prepared to receive messages of distress as well, the cost must be substantially increased. Each vessel so equipped can act as a "life boat" when the need arises and in spite of all precautions the need does sometimes arise.

The organization of "watch keeping" has been greatly aided by recent developments in the automatic alarm signal. Conditions with which such an apparatus must comply before it can be accepted as effective were prescribed by the international radio convention signed at Washington 1927. Several types of apparatus have been accepted as fully meeting these requirements and automatic alarms of such types have been in use for some time. Their efficiency has been established on a large number of passenger and cargo vessels.

The conference of 1929 now rules that all ships engaged in international voyages except cargo ships of less than 1600 tons gross shall come under the international radio convention in regard to radiotelegraphy. There is a proviso that each nation may postpone the application of this requirement to ships between 1600 and 2000 gross tons but in the meantime such ships are to carry an efficient installation and a qualified operator. If such ships are not fitted with an automatic alarm, always in operation when the operator is not actually on watch, they are to maintain according to size and service certain prescribed hours of watch. The object of the convention is to secure maximum hours of watch keeping on a maximum number of ships.

If in the judgment of any government the route and condition of the voyage of the ship are such as to make a radio telegraphic installation unreasonable or unnecessary it may exempt such ships belonging to its own country but only if, being passenger ships they do not go more than the 20 miles off shore or 200 miles in the open sea between consecutive ports; or if, being cargo ships, they do not in the course of their voyage go more than 150 miles off shore. Each government is empowered, subject to the same condition as to route and voyage, to exempt from the requirements as to carrying wireless installation, passenger ships within certain restricted and specified areas. It is recognized that the number of ships trading within these areas is limited and the exemptions are based on economic conditions and will not materially affect the added degree of safety that the convention will confer on ocean ships in international voyages.

Navigation Regulated

IT IS natural that the rules promulgated by the conference on the safety of navigation are more general than any others since they apply to all ships on all voyages. These rules include some changes and developments of great interest to the mariner. All direct dangers to navigation are to be reported and communicated to all concerned. All governments participating in the conference will co-operate in collecting and distributing meteorological information in a systematic and uniform manner for the purpose of aiding navigation.

After the 1914 conference an ice patrol and derelict service was established and it has been managed since then, on behalf of all the governments interested, by the United States. This service is to be continued but its objects are more precisely defined and its cost has been adjusted in accordance with present conditions. The present system of north Atlantic routes is continued with the understanding that it is to be constantly studied so that any necessary alterations may be made from time to time. Ships are to follow established routes as far as possible and they are to avoid crossing the fishing banks during the fishing season.

International collision regulations were carefully reviewed by the conference. No change has been made in the steering and sailing rules and the arrangement, style, and wording of these well known rules has been preserved. Important alterations however, have been made in the rules relating to lights and signals. It is forbidden to use any light which can impair the visibility of any of the navigation lights. The second white light is made compulsory on all steamships of 150 feet and upwards in length. The stern light is to be fixed and day signals are provided for vessels at anchor or aground in or near a fairway. A special day signal is also provided for sailing vessels when under steam or motor power. New fog signals are prescribed for vessels over 350 feet long, for vessels towed, and for vessels aground or in or near a fairway. The radio distress signal is added to the list of distress signals and the use of any distress signal except for the purpose of indicating that a vessel is in distress is prohibited. In some cases the range of the lights to be carried has been increased because of the greater speed of ships, and the position of the lights has in some instances been more precisely defined.

One of the most startling changes to old mariners is the rule that after midnight June 30, 1931, helm or steering orders must on all ships, covered by this convention, be given in the direct sense, that is to say, when the ship is going ahead, and order containing the word "starboard" or "right," or any equivalent of "starboard" or "right" shall only be used when it is intended that the wheel, rudder blade, and the head of the ship, shall all move to the right. The conference agreed that it was essential that the system under which helm orders are given should be international because ships have to employ pilots of all nationalities and may employ seamen of other nationalities than their own. Some of the countries that still retain the indirect system intend to replace it by the direct system, and those that have made the change made it plain that they experienced no difficulty in doing so.

Specific rules are given for the procedure to be followed when a distress signal has been sent out and received by other ships. All passenger ships of 5000 tons gross and upwards must be fitted with a direction finding apparatus and all ships of over 150 tons gross must be equipped with an efficient signalling lamp. The governments represented at the conference were in agreement that all their ships whether passenger or cargo shall be efficiently and sufficiently manned.

Certificates Issued

UNDER the authority of each government the conference of 1929 has provided for issuing certificates to all such ships as after survey, are found to comply with the conditions of the convention. Each government is also empowered to issue exemption certificates specifying the condition under which it has granted exemption to a ship in accordance with the provisions of the convention.

Such certificates are to be accepted by the other governments represented at the conference for all purposes covered by the convention, that is, they are to be regarded by the other contracting governments as having the same force as the certificates issued by them to their own ships. On the other hand no ship is entitled to claim the privileges of the convention unless it holds a proper valid certificate.

Having in mind technical progress the convention authorizes each government to accept in substitution for particular fittings, appliances or apparatus, prescribed in the regulations,

(*Continued on Page* 68)

Pulverized Coal Given Sea Trial

Successful Test of S. S. West Alsek—Equipped with Unit System of Pulverized Coal Burning—Fine Maneuverability—Made 12.7 Knots

By H. R. Simonds

MARINE history went ahead a pace recently through the successful operation of the WEST ALSEK on her sea trial out of New York harbor. A perfect day greeted the early rising marine engineers and fuel experts who gathered at 8 o'clock, June 19, at pier 6 Hoboken to board the freighter WEST ALSEK for her first trip burning pulverized coal. The ship has been converted by the shipping board from an ordinary coal fired steam vessel. The conversion work was done at the Tietjen and Lang plant of the Todd Shipyards Corp. Interest in her performance was greatly increased by the fact that her pulverizing and burning equipment embodies many new features intended to overcome the disadvantages of earlier attempts at pulverized coal burning in connection with marine boilers.

On the trial the ship carried no freight, but those who have had charge of her conversion were enthusiastic over the 12.7 knots average which she made over a 32 mile course and they estimated that she would exceed 9.5 knots when fully loaded. This figure is nearly 2 knots higher than her usual performance with the old method of grate burning.

When the fuel conservation committee was asked by the United States shipping board to pick out a vessel for the installation of the Todd pulverized coal burning equipment, it selected the WEST ALSEK as being one of the worst examples of old type inefficiently powered vessels—the type that "just can't make money" for its owners in the present competitive age, according to C. J. Jefferson, head of the fuel conservation section of the United States shipping board, New York, and one of the most active figures in the conversion program. On one of her last trips across the Atlantic, the WEST ALSEK averaged about 6½ knots. Yet her condition was not much worse than that of a large fleet of ocean going freight ships today.

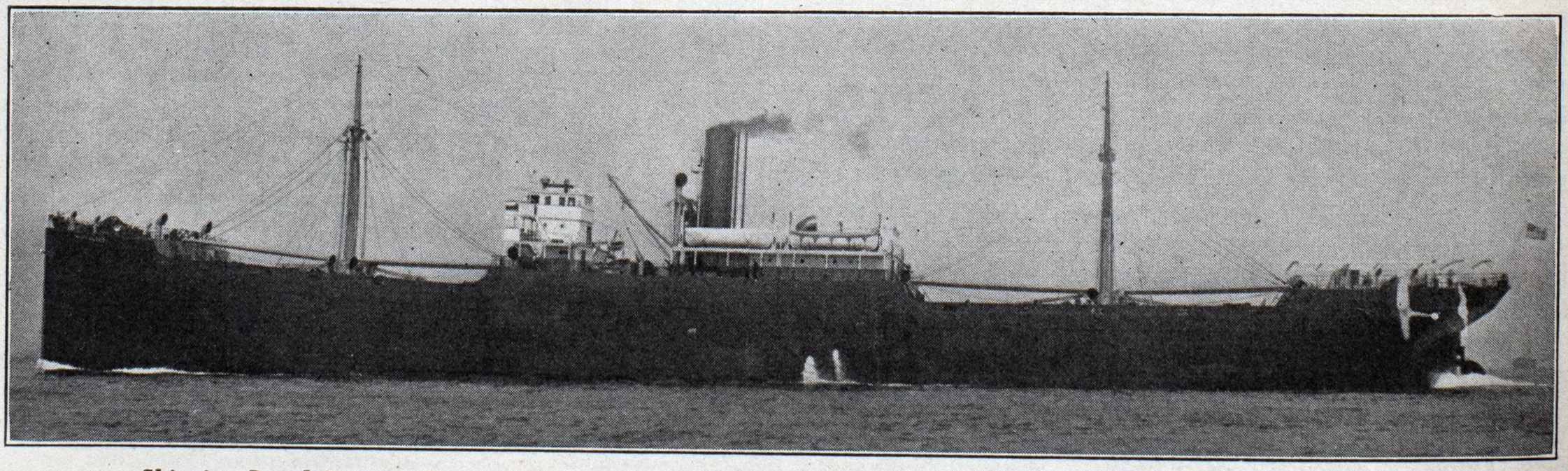
The first vessel to be put into service by the shipping board with pulverized coal equipment was the S. S. MERCER, but considerable difficulty in maneuvering that vessel was experienced due to lack of flexibility of the pulverizing and burner equipment. The WEST ALSEK has a unit system consisting of an independent mill at each burner, so that any one burner can be shut down independent of the others. The maneuvering properties of the WEST ALSEK proved to be exceptionally good. The vessel came to slow speed, stopped, started, stopped again, remained idle for ten minutes or more awaiting docking space and during all this time the stack exhaust was of a light gray color, pronounced excellent by the fuel experts.

The WEST ALSEK is the fourth or fifth ship of her size to be equipped for use of pulverized coal, and is the first installation of a unit system of pulverized coal burning on a regular operating vessel. One of the difficulties of adapting pulverized coal to a vessel is the short space within a scotch boiler for the combustion of the flame. In order to have pulverized coal and economy, combustion must be complete. Other difficulties have to do with lack of space outside of the boiler for the equipment and with features of flexibility as mentioned. The use of pulverized coal with a scotch boiler heretofore has been accomplished both here and abroad with some difficulty.

For such an installation to be commercially feasible, it must be accompanied by a reduction of fuel and labor costs commensurate with the increased cost of the apparatus and its installation. Tests made with scotch boilers particularly in experimental work at the Philadelphia navy yard indicate that an increased boiler efficiency of from 10 to 20 per cent may be expected. This increased efficiency is one of the chief reasons back of the use of pulverized coal. Both pulverized coal and oil reduce the labor cost about equally and engineers who have studied both systems

Particulars West Alsek

THE WEST ALSEK *is a steel cargo vessel of* 8529 *tons deadweight built by the Skinner & Eddy Co., Seattle, Wash., in* 1918. *The vessel is approximately* 410 *feet long,* 54 *feet in breadth and* 29 *feet* 9 *inches deep. Until the present time she has been in transatlantic service as a hand-fired coal burner. This vessel is equipped now to burn powdered coal in three single ended three-furnace scotch boilers. There is one triple expansion steam engine of* 2750 *indicated horsepower and the usual auxiliaries found on vessels of this class.*



Shipping Board Steamer West Alsek Passed Successful Sea Trial with Todd Unit System, Pulverized Coal Burning

say that eventually the selection will depend upon the market for fuel oil and coal.

The development of the power plant of the WEST ALSEK is the result of co-operation between many firms and experts. The work was started by the Todd Shipyards Corp., New York, with the co-operation of the Erie City Iron Works, Erie, Pa. The fuel conservation committee of the United States shipping board assumed much of the responsibility back of the conversion plan, and much credit for the successful completion must go to Prof. H. R. Seward, of Yale university, acting chairman of that committee and to C. J. Jefferson, head of the fuel conservation section of the United States shipping board and to the members of the committee and the section. The navy department placed the facilities of the League Island navy yard, Philadelphia, at the disposal of the Todd Shipyards Corp., for test purposes and preliminary work in connection with the development of the new equipment. One of the navy ships was equipped as a floating pulverized fuel laboratory. The guests aboard the WEST ALSEK on her trial trip were taken down to the engine and boiler room in small groups of five or six, and the various features were explained in considerable detail. One of the chief improvements in the minds of those who attended the trial of the S. S. MERCER was the greater roominess in front of the boilers of the WEST ALSEK. Another very noticeable change was the quietness of operation of the new installation. It was possible, for instance, for five or six men to distinctly hear the comments of the guide who stopped to explain details of operation.

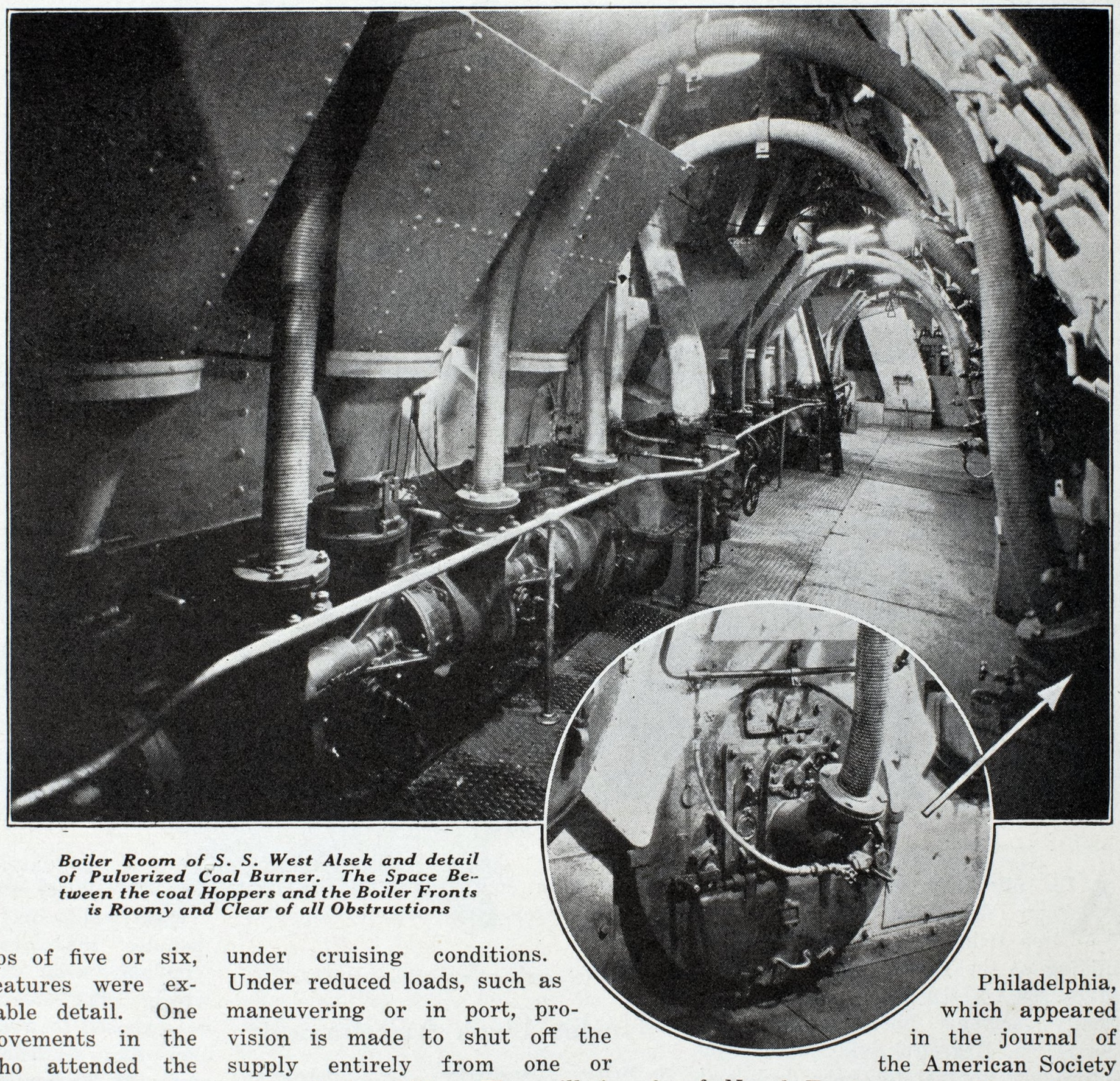
The cycle of events in the burning of pulverized coal on the WEST ALSEK is briefly as follows: the raw coal either from the upper deck or from the lower cross bunker is conveyed over a grissly to the first mill or crusher. Here it is reduced to one-half inch size and is then fed by gravity to a screw conveyor running athwartship. The trough of the screw conveyor is fitted with nine downcomers, one for each mill. Above each of the mills is a hopper, containing about an hour's supply of fuel, into which these downcomers discharge; the fuel going thence by gravity through the disk feeder to the individual pulverizer. The disk feeder is so adjusted that identical amounts of fuel will go to each of the pulverizers when the vessel is under cruising conditions. Under reduced loads, such as maneuvering or in port, provision is made to shut off the supply entirely from one or more of the mills. The mill is of the two-stage, centrifugal type, fitted with a fan having tangential discharge. The coal is discharged from the fan to the burners through flexible tubing. In passing through the burners, the coal and the primary air, which is conveying it, are given a rotating motion by the internal diffuser.

The air heater, is of box-like construction, forming the burner diaphragm. Air is taken into this heater from the front and its temperature is raised by the heat of the furnace. It is then carried over to the mills. This increase in temperature is necessary to take up the moisture that may be in the coal before it goes to the pulverizers.

By using direct connected turbine drive, the electrical losses have been eliminated. The first cost of the installation has been reduced by using direct connected steam units.

The technical features of the equipment are to be covered in a detailed report to be published in the near future. Some details are described in a paper by R. C. Brierly, mechanical engineer, navy yard, Philadelphia, which appeared in the journal of the American Society of Naval Engineers, in May of this year.

The clear passage between the pulverizing mills and the burners is shown in the illustration. The burner is a new type designed to secure an exceptionally intimate mixture of coal dust and air for combustion. It is arranged so that adjustments can be made to the diffusing cone from the furnace front, thus affording control of the mixture and combustion. An oil burner used for ignition and also for maneuvering is provided in addition to the pulver-



Boiler Room of S. S. West Alsek and detail of Pulverized Coal Burner. The Space Between the coal Hoppers and the Boiler Fronts is Roomy and Clear of all Obstructions

ized fuel burner. Light fuel oil is used and thus if required in maneuvering the coal supply can be shut off entirely and the oil burner used.

Perhaps the key to the whole success of the WEST ALSEK lies in the development of the pulverizing mills. These have been designed first to secure the finest degree of pulverization with machinery of the least possible weight and bulk, and second to be wholly flexible so that any one may be shut down and replaced.

Actual fuel consumption and other data of the trial were not reported but dock tests gave an evaporation per one pound of fuel used, of 10.7 pounds where 8.5 pounds with coal on grate is usual. The pounds of coal fired per cubic foot of combustion space is also high, as is the evaporation per square foot of heating surface.

These high efficiencies are largely due to the extremely fine pulverization, which is noted as 92.53 per cent through a 300 mesh sieve at the 300-pound rate, and 88 per cent at a 400-pound rate, whereas the amount through a 200 mesh sieve is nearer the usual rate.

Shortly after her trial trip the WEST ALSEK proceeded to Baltimore to load cargo. The engineers who made the run to the southern port reported on their return to New York that the pulverized coal burning system performed perfectly and that the engine turned up 75 to 78 revolutions per minute, giving the vessel an average speed of 11.8 knots.

Profits of I. M. M. Co. Doubled in 1928

The annual report of the International Mercantile Marine Co., 51 Newark street, Hoboken, N. J., for the year ended Dec. 31, 1928, shows that the company doubled its profits over the preceding year and that the outlook for 1929 is most favorable. The report covers the operation of the company and its subsidiaries, the American, Red Star, Atlantic Transport, Panama Pacific and Leyland lines, and shows a profit of $1,205,-250.31, after deducting depreciation, as compared with a profit of $561,-054.02 for the year 1927. The earnings of the parent company for 1928, including dividends from its subsidiary companies out of their surplus for the year 1928 and prior thereto and from the operation of directly owned steamers show $1,663,105.92, after deducting all expenses and bond interest, compared with $977,496.30 for 1927.

The earnings so far for 1929 are somewhat better than for the corresponding period last year and the outlook is more encouraging.

Load Line to be Enforced

In line with the Board of Trade inquiry into the VESTRIS disaster, the load line measure passed at the last session of congress will become effective September 1, 1930. This will apply to vessels of 250 gross tons or over going on foreign voyages from the United States ports, exclusive of the Great Lakes. The load line marks are to be fixed by the secretary of commerce in conjunction with the American Bureau of Shipping or other agency appointed at the request of shipowners. The regulations will be enforced by collectors of customs and penalty for violation will be $500 with an additional penalty of $100 for failure to enter drafts and load lines in the log for each voyage. Tampering with marks may be punishable by a fine of $1000 or one year's imprisonment.

A great movement of freight to all parts of the world was recorded at the Tampico fiscal wharf, Mexico City, during April, according to official figures. During the month 51,627 tons were handled at the fiscal wharf alone. Of this amount, 17,200 tons were imports and 34,428 tons exports. In April, 19,623 tons of minerals were shipped through the port. Zinc concentrates led with 11,427 tons.

The ministry of industry, commerce and labor, Mexico City, has completed plans for the dredging and modernization of the ports of Tampico and Vera Cruz, two of the most important gateways to Mexico. Work on these projects will start during June, it is announced. Vera Cruz harbor, which has been shallowed owing to breaks in the sea wall which have allowed the entrance of much sand, will be dredged to permit of the entrance of ships of any draught.

Auxiliaries on South African Liner

By Robert W. Clark

ALL auxiliary machinery of the new American South African line twin screw motorship, now building at the yard of the Sun Shipbuilding & Dry Dock Co., will be electrically driven. The Westinghouse Electric & Mfg. Co. will supply the motors and control for both deck and under deck machinery, as well as the three 220-kilowatt diesel-drive generators which supply the auxiliary power.

This vessel will displace 14,950 tons, and in addition to her freight carrying capacity, will have twenty staterooms for passengers. The principal dimensions of the hull are: Length over all, 470 feet 8 inches; molded beam, 61 feet 6 inches; draft, 26 feet.

The author, Robert W. Clark, is a member of the staff of the publicity department of the transportation section of the Westinghouse Electric & Mfg. Co.

The main engines of Sun-Doxford opposed piston type, will develop 5200 shaft horsepower, giving the ship a sea speed of 14 knots.

Under Deck Auxiliaries

No.	Motors	Application	Horsepower
2		Main air compressors	65.0
2		Main engine turning	20.0
1		General service and fire pump	40.0
1		Salt water circulating	50.0
1		Fresh water circulating	50.0
1		Fire and bilge pump	40.0
1		Sanitary pump	15.0
2		Lubricating oil pumps	12.5
2		Fuel oil transfer pumps	7.5
1		Engine room bilge pump	7.5
1		Bilge and ballast pump	50.0
1		Fuel oil purifier pump	7.5
3		Fresh water pumps	3.0
2		Lubricating oil separators	2.0
2		Fuel oil separators	2.0
2		Fuel oil pumps	2.0
1		Refrigerating machine	5.0
1		Machine shop	7.5

Electrically driven deck machinery includes the steering gear, anchor windlass, cargo winches, and warping winch. The steering gear, which is not exposed to weather, is driven by a drip-proof, semienclosed, self-ventilated motor of 30 horsepower. The anchor windlass, driven by a waterproof motor of 65 horsepower, is equipped with a waterproof brake and magnetic control. There are 14 cargo winches, 12 of which are driven by 25-horsepower motors and two by 30-horsepower motors. The winches are equipped with snap action control and waterproof brakes. The warping winch is driven by a 30-horsepower waterproof motor, has a waterproof brake and is operated by a magnetic type control.

These waterproof deck motors are of the most rugged type. The frame is

of cast steel, split horizontally to facilitate the removal of the armature. The feet are cast integral with the lower half of the frame and are widely spaced and ribbed for strength and rigidity.

Armatures are made small in diameter to reduce the moment of inertia. The armature coils are form-wound of asbestos covered strap, insulated with mica and asbestos tape. The assembled armature is dipped and baked several times in insulating varnish. Shafts are of axle steel, large in diameter, and ground to dimensions. They have tapered extensions with nut and lock washer at each end to facilitate removal of pinion and brake wheel.

Bearings are of the sleeve type, babbitt lined. They are supported rigidly between the two halves of the frame. The journals are lubricated by means of oil rings. Stuffing boxes with graphitized asbestos packings are used to prevent the leakage of water along the shaft. Leak-off traps are also provided inside the stuffing boxes to drain off any water which might work its way through the stuffing box and get into the bearing oil.

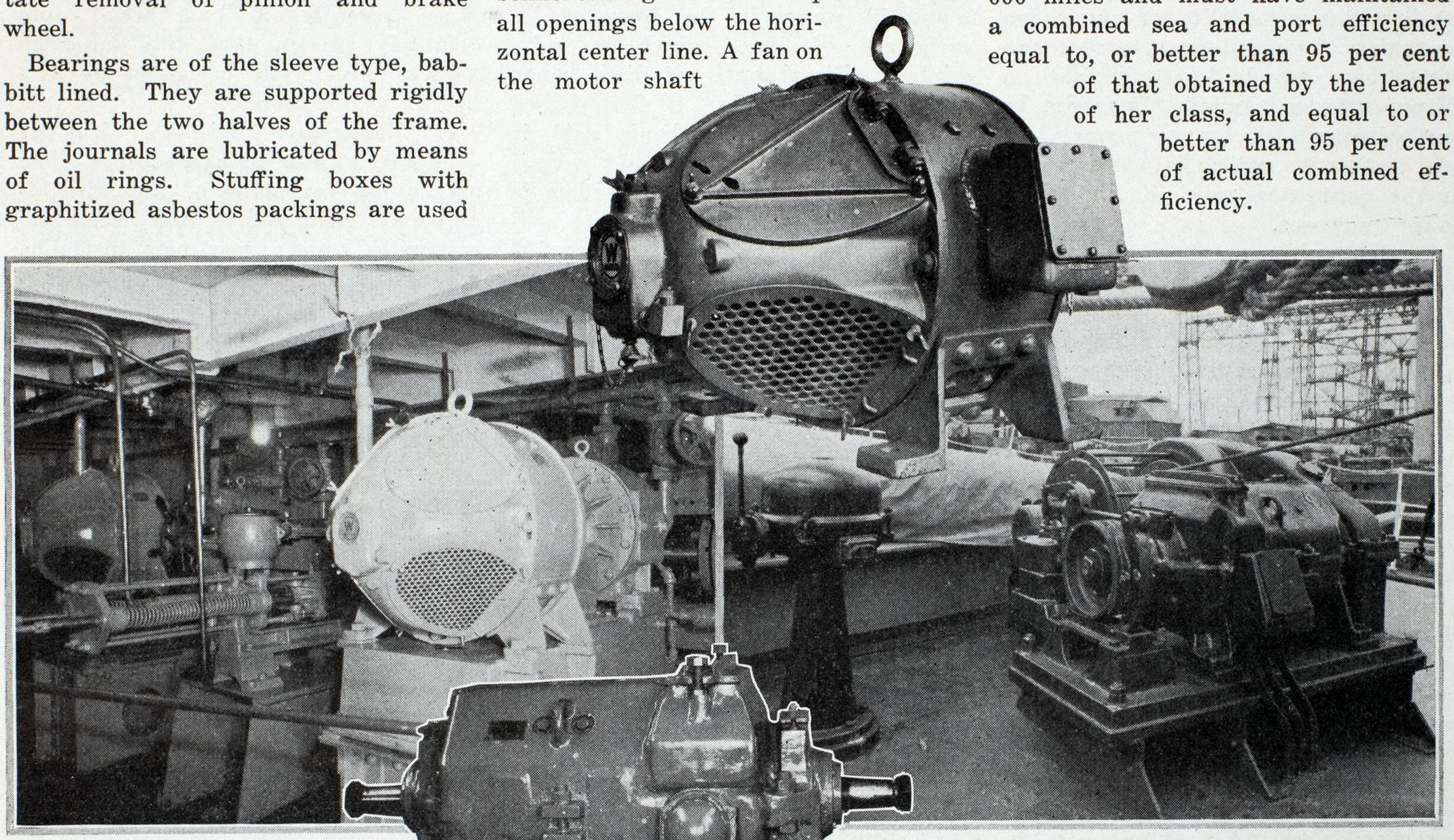
All details combine to produce motors noted for their reliability, ruggedness, heavy overload capacity, quick starting and stopping characteristics, and water-tightness. All of these contribute to low maintenance costs and long effective service.

The engine room auxiliaries and other under deck auxiliaries are all electrically driven, and are listed with the power of the motors in the accompanying table on page 24.

All of the motors tabulated are of the drip-proof semienclosed, self-ventilated type, with the exception of those which drive the main engine turning gear and the lubricating and fuel oil separators. These motors are of the totally enclosed type. The drip-proof, semienclosed, self-ventilated motors are designed primarily for marine service, and provide complete protection of the electrical parts from the moisture and dripping water so often encountered in under deck service.

The motors are totally enclosed on the top half and semienclosed on the bottom half. The rear or pulley end brackets are cast solid on the top, while the top openings of the commutator end bracket are fitted with gasketed, cast iron covers which fit against flat surfaces. Sheet steel, semienclosing covers are provided for all openings below the horizontal center line. A fan on the motor shaft draws air in through the perforated covers on the lower half of the rear bracket and discharges it through the perforated covers on the lower half of the front bracket. This insures a positive and ample circulation of cooling air and results in a motor with dimensions only slightly larger than an open-type motor.

All field coils and armature windings are treated with moisture resisting compounds and all parts subject to rust are sherardized. These motors have established enviable records in marine circles and their performance in service indicates the wide experience and careful attention to details which has been put into their design and construction. For marine service it has been found that the utmost in quality is necessary to stand up.



Electric motors of this type will be used on the new Motorship building for the South African Liner at the Sun shipyard

Wilscox on Honor Roll

It is interesting to learn that the motorship WILSCOX, operated by the Roosevelt Steamship lines for the United States shipping board, has been placed on the board's honor roll for the period from Jan. 1 to June 30, 1929. The honor roll comprises the 50 ships out of 283 active vessels in operation which show the best operating record. To entitle a vessel to be listed on the honor roll, she must have traveled at least 20,000 miles and must have maintained a combined sea and port efficiency equal to, or better than 95 per cent of that obtained by the leader of her class, and equal to or better than 95 per cent of actual combined efficiency.

The WILSCOX is equipped with a Nelseco M. A. N. double acting, 2-cycle, air injection, 4-cylinder diesel engine, developing 3680 brake horsepower at 115 revolutions per minute. Her deadweight capacity is 9235 tons and she was converted for the shipping board by the Fore River plant of the Bethlehem Shipbuilding corporation. She is now en route to Sidney, Australia, on the first leg of a round-the-world trip.

The Sheriffs Mfg. Co., Milwaukee, has just delivered to the Manitowoc Shipbuilding Corp., Manitowoc, Wis., a new propeller for the whaleback steamer CHRISTOPHER COLUMBUS, now undergoing reconditioning.

Treating Water for Boiler Use

Many Harmful Impurities—Sea Water—Condenser Leakage and Makeup Feed—Treatment of Water at Source or at Boiler

By L. F. Wilson

Lieutenant-Commander, United States Naval Reserve

IT IS pretty well known that practically all water supplies carry impurities to a greater or lesser extent. In the operation of either steam or internal combustion power units, close attention to, and full understanding of the water conditions is of greatest importance for efficiency and even for safety. Conditions of water impurity can only be corrected with a purpose of use in mind. It cannot be purified completely by any process, except distillation, which is not practical in the quantities required for steam power purposes.

For human consumption, the organic impurities are those to which greatest attention must be given. For steam purposes, it is the mineral impurities in solution which cause the boiler operator to worry. The United States navy, as everybody knows, operates steam vessels all over the world on salt as well as fresh water. It is not so generally known that the navy is one of the largest operators of stationary plants, however.

In large vessel operation every effort is made to return to the boilers as much condensate as possible so that the "make up" water requirement will be small. To this end the condensers are of the "closed" type and are watched carefully for leaks.

In fresh water the proportion of raw water used is not of so much importance. Depending upon the nature and proportion of impurities, it is sometimes desirable to operate with raw water proportions up to 100 per cent. In the latter cases condensers are useless. The perfect boiler water would not be pure water but would be one carrying a small amount of dissolved carbonate of lime or magnesia.

Common Impurities in Water Supplies

Water may be alkaline, neutral or acid; it is generally found to be alkaline. Waters are usually acid when drawn from coal mines or from the vicinity of coal beds. These waters may carry sulphuric acid, which is produced by the oxidation of the pyrites or sulphide or iron, which is always found with coal.

In the order of their most frequent occurrence, the more common impurities in the natural water supplies are named and described as follows:

1. *Calcium Carbonate* ($CaCO_3$)—Carbonate of lime or chalk is the most common form in which lime occurs in water. It is but slightly soluble in chemically pure water, but when carbonic acid is present it is found in water in the form of bicarbonate of lime, which is quite soluble. Bicarbonate of lime when carried into a boiler is decomposed by the heat. The carbonic acid is driven off with the steam and normal carbonate of lime is formed, which is practically all precipitated in the boiler when the temperature reaches 230 degrees Fahr., corresponding to very low boiler pressures.

2. *Calcium Sulphate* ($CaSO_4$)—Sulphate of lime or plaster of paris is a common constituent of natural water and is responsible for the hardest kind of boiler scale. Scale formed from sulphate of lime sometimes is as hard as porcelain. It is almost entirely precipitated when the boiler pressure reaches 165 pounds (375 degrees Fahr.), precipitation being in the form of heavy crystals which at once fasten themselves to the sides of the boiler, forming a scale of great hardness. Sulphate of lime attaches itself to the heating surfaces of the boiler much more firmly than does carbonate of lime.

3. *Sodium Chloride* ($NaCl$)—Common salt is a very common impurity varying in amounts from less than one grain to very excessive quantities. It has corrosive action to a considerable extent. This element also causes foaming and priming due to its cumulative properties under the influence of heat and pressure inside the boiler. It greatly increases the surface tension of the water and tends decidedly to cause foaming and priming.

4. *Carbonic Acid* (CO_2)—This substance is found in most natural waters and is the same as the gas which we know in soda and seltzer waters, and is responsible for the presence of many of the mineral impurities, as it holds them in solution in the water. It has corrosive action, manifesting itself in the form of pitting.

5. *Sodium Sulphate* (Na_2SO_4)—Glaubers salts are sometimes naturally present but are more often concentrated in boilers artificially as the result of the reaction between sodium carbonate (soda-ash) and calcium sulphate when soda-ash is used as a treatment. The sodium sulphate is perfectly soluble and its properties are acid which is evidenced in pitting and grooving of heating surfaces. More recently it has been quite definitely proven that this impurity induces electrolytic corrosion by acting as an electrolyte.

6. *Magnesium Carbonate* ($MgCO_3$)—Magnesia acts in exactly the same manner as carbonate of lime, its bicarbonate being soluble and its normal carbonate being practically insoluble. Magnesium carbonate is used as lagging for boilers and is an excellent nonconductor of heat, but when in the form of boiler scale, it is on the wrong side of the shell.

7. *Magnesium Chloride* ($MgCl_2$)—This substance is a very objectionable mineral when present in boiler water, it being very corrosive in its action, causing pitting and grooving in boilers.

8. *Magnesium Sulphate* ($MgSO_4$)—Is both corrosive and scale forming. It is a very common constituent of well waters and causes harmful action inside the boiler.

9. *Calcium Chloride* ($CaCl_2$)—Is sometimes found in mineral water, in which it is very soluble. It does not of itself form scale, but a transfer of acids takes place and calcium sulphate is formed when other sulphates are present. Its action is chiefly corrosive.

10. *Silica* (SiO_2)—Is a very common constituent of the southern water supplies of the United States, forming tough incrustations quite impervious to heat and difficult to counteract after they have once formed upon the inside of a boiler.

11. *Sodium Carbonate* (Na_2CO_3)—Is spoken of as soda-ash when in commercial form and causes considerable trouble, particularly in high pressure boilers, by causing foaming and lifting of the water. It is not particularly corrosive unless present in excessive amounts. It is used as a treatment for calcium and magnesium sulphate.

12. *Iron*—Is generally present as a bicarbonate except in the vicinity of coal mines, where it appears frequent-

ly as iron sulphate, resulting from oxidation of iron pyrites, and having the same action as sulphuric acid. Iron bicarbonate is a very unstable compound quickly giving off its excess carbonic acid and, upon absorbing oxygen, is converted into iron rust. This is the reason for the pronounced red color in certain waters when exposed to air.

13. *Suspended Matter*—May be organic or inorganic. Its presence depends upon the source of the water supply. Surface supplies frequently have large proportions of suspended matter, particularly after heavy rainfall. All dirt and sediment carried as suspended matter in the water will have a tendency to cause foaming and priming. It forms scale only by being cemented to the boiler by other materials.

Scale Formation and Prevention

There have been a great many authoritative statements as to the cost, in losses, of scale on the heating surfaces of boilers. It is not the intention to quote any of them. It is assumed that the reader will already have recognized the very severe effects of boiler scale formation as represented in costs of flue and staybolt renewals, fire box sheet repairs, coal consumption, boiler failures, etc.

It may be noted, however, that an error commonly made by those who attempt to calculate, mathematically, losses in boiler efficiency due to scale, is failure to make allowance for the location of the scale in the boiler. Since, in a boiler of the locomotive type, the fire-box area is responsible for most of the heat transmission, scale of given thickness in the heating surfaces of the fire-box will have a far greater effect on actual fuel consumption than will that on the flues and tubes. On the other hand, the actual rate of transfer of heat from gases to water through the heating surfaces represented in the tube area farthest from the fire-box, is so low that its complete insulation would have little effect on the amount of fuel actually consumed.

In general the same differentiation must be made in estimating effect on maintenance costs due to overheating on account of insulating scale formations. Some kind of treatment to combat scale formation is warranted when the water contains more than eight grains of hardness per gallon. The kind of treatment best adapted depends upon the conditions. The intelligent man of technical knowledge combined with practical experience in the chemistry of waters, and in boiler operation, weighs very carefully all of the conditions and all of the arguments for and against any single method of water treatment, before making a decision.

Treating plants located at water supply stations are quite extensively used. Their installation involves rather heavy capital expenditures. Their operation involves the use of chemicals the nature of which is limited principally to soda ash and lime. In some circles there is a fixed and erroneous impression that the water from these treating plants is purified. The contrary is the case. The water treatment engineer has by the operation of the treating plants, substituted solids, remaining in solution, for the scale forming solids, which are settled out.

Good Boiler Feed Water

FORMATION of scale and corrosion are constant enemies of efficient operation and long life of marine boilers. Impurities in boiler feed water are the cause for both of these difficulties and ways and means of overcoming the injurious effect of such impurities have been proposed frequently. The present article carefully analyzes the whole problem and the recommendations for treatment depends on the conditions of service. Treatment of boiler water should not be done by guess. The water should be properly analyzed for harmful mineral compounds and the proper kind of corrective should be introduced under competent technical supervision to determine the kind and amount. Every marine engineer will find a great deal of valuable information upon this perplexing problem in this article by Commander Wilson.

The solids which remain in the water after wayside treatment, are those which cause foaming and pitting, when concentrated by boiler evaporation. It will be observed, therefore, that capital expenditure for treating plants, and the decision to operate them should be based upon the assurance gained by careful investigation, that the advantage gained by the elimination of the scale forming solids alone, is sufficiently great to warrant; (a) cost of the treating plants; (b) cost of the required chemicals; (c) cost of methods required to reduce the foaming tendency of the treated water.

When the above conditions are met it is believed that treating plants are a desirable item in the equipment of modern hard-water district, power plants and vessel supply stations. Under all other conditions, it is believed that the direct use of properly worked out water treatment chemical compounds, in the boilers or supply tanks, is the most economical, efficient and best adapted method of boiler water treatment.

It is for this reason that application of boiler water treatment compounds at the supply tanks, as the water is pumped, is sometimes advocated. By this method no reaction takes place, or is expected, until the water has been passed to the boilers. The resulting reaction in the boilers is exactly the same, by this method, as would be obtained by applying the compound to the boilers themselves.

Sometimes when a very large amount of water is required from one source of supply and where that water is used only and entirely in boilers for steam making purposes, it is desirable to have the compound put into the water by the pumpers instead of by those operating the boilers.

Wide Range of Boiler Compounds

In the development of water treatment compounds for application directly to the boilers or tanks, there is no such limitation in available chemicals as is the case with the outside treating plant. On the contrary, these compound formulae run through a wide range of raw chemicals of known merit for certain desired effects. They also range through many forms allowing of selection for units of weight and measure such as sticks, briquettes, slabs powders and liquids.

In designing these compounds, not only laboratory analyses should be the guides, but consideration for ease of application, avoidance of waste, and greatest accuracy under adverse conditions must also be given.

For various and obvious reasons when water treatment chemical compounds must be purchased and stocked in large quantities and issued for use under widely varying conditions, something in the nature of an "all-purpose" material must be adopted.

Such is the problem of the United States navy which operates steam boilers in all parts of the world. A compound formula was adopted some time ago, to meet as nearly as possible these conditions. The theory was to have in the same compound each of the better known reagents in a fixed proportion and then meet the varied water conditions by using what would be, under other methods, an excess quantity of the compound in order to gain the desired reaction from the particular reagent in the compounds, upon the predominant impurity in any particular water. Economy by standardization in purchase,

storage and transportation is thus gained at some expense in efficiency at point of application.

As specified by the navy, this material is a powder, but for commercial use, one company manufactures the "navy standard" in compressed briquet form, thus again obtaining a unit of weight and measure, and ease of use.

Navy Specifications No. 13-C-3b for Boiler Compound

General Specifications

1. General specifications for inspection of material, issued by the navy department, in effect at date of opening of bids, shall form part of these specifications.

Composition

2. Boiler compound shall be powdered and composed of sodium carbonate, tri-sodium phosphate, starch, and cutch or dry extract of hemlock, oak, or chestnut bark.

Method of Manufacture

3. These materials shall be intimately mixed and finely powdered. The product shall be readily soluble in water and uniform in composition.

Proportion Shown by Analysis

4. The compound shall show on analysis at least 76 per cent of anhydrous sodium carbonate (Na_2CO_3) 10 per cent of tri-sodium phosphate ($Na_3PO.12H_2O$), 1 per cent of starch, and sufficient cutch or dry extract of hemlock, oak, or chestnut bark to yield 2 per cent of tannic acid. The remainder to consist of water and only such impurities as are common to the ingredients. When this material is briquetted, sodium silicate is added to the formula as a binder and also as an additional reagent.

Boiler Corrosion and Prevention

Corrosion or pitting in boilers has always been a matter of greater or lesser seriousness, but in the past the causes have usually been traceable to some easily corrected water condition. In recent years and particularly in locomotive operation on our western railways, the pitting tendency has increased alarmingly and, to the great concern of many water service engineers, the tendency appears without any apparent primary cause in the water itself. The effect of common acids is so well known as to require no discussion here. Fortunately they are easily neutralized in boiler waters.

One form of pitting takes place as follows: In the presence of moisture, carbonic acid and oxygen simultaneously attack the iron and steel, forming a thin layer of carbonate of iron. The reaction continuing, oxide of iron and ferric hydrate are formed. During these reactions, the carbonic acid is liberated on the moist metal and, reacting with more oxygen from the air, carries on the process of corrosion. This is now further aggravated by the fact that the hydrated oxide on the surface of the metal is electronegative to the metal itself. Excited by the presence of moisture and carbonic acid, it creates a galvanic current at the expense of the iron, and as the mass of rust formed is porous, the action continues.

If, then, a suitable electrolyte be supplied in the boiler water, we have the means for more or less electroactivity represented in the undesirable transfer of metal, resulting in pitting and grooving. It seems to be generally admitted that sodium sulphate in concentration in the boiler water furnishes this electrolyte. Tests show that galvanic action increases with greater concentration of this soluble impurity.

There seems to be little question but that corrosion also increases, as does the scale forming tendency, with higher temperature which go with the higher pressures in modern boiler operation.

A type of boiler corrosion which is usually given little attention is that which is occuring in the boilers of stored locomotives and dead boilers of power plants. It is merely ordinary oxidation taking place under the most favorable conditions—those of dampness in the presence of air.

Assuming that the water in boilers must be of certain nature to allow of its acting as an electrolyte, it seems but logically possible to change that nature in such a way as to inhibit electrolytic action. The value of the chromate salts for this purpose has not been fully appreciated in the past. Perhaps their cost has also delayed complete realization.

In its formulae developed to inhibit boiler corrosion one company now makes use of the chromates in such a way as to hold the cost down to a point well within reason, while at the same time taking full advantage of their inhibiting effect.

These antipitting formulae lend themselves to manufacture in the solid form, earlier described, as most practicable for easy application and best of all they can be made to include such of the antiscaling reagents as to make a combined treatment of the two.

Properties of Sea Water

Since the chlorides cannot be precipitated or removed from water by any known method of treatment except distillation, sea water cannot be treated. It is interesting to note, however, that sea waters vary considerably in their proportions of impurities in different parts of the world.

In the accompanying table the samples were taken as follows: 1, English Channel; 2, Mediterranean Sea; 3, Off Point Sur, California.

Impurities in Three Salt Waters in Grains Per Gallon

	1	2	3
Sodium chloride	1622	1587	1529
Sodium sulphate	.....	.....	162
Calcium carbonate	2	1	5
Calcium sulphate	82	9	77
Magnesium sulphate	134	409	.....
Magnesium chloride	214	358	284
Free carbonic acid	.....	.....	9

Since both the carbonates and the sulphates are scale forming solids, it must be considered that, in evaporating one thousand gallons of any of the above waters, there will be from 20 to 40 pounds of solids left behind. Many large ships use more make-up water than this each day.

It is not much of a leak in a condenser which would pass five thousand gallons of water to the boilers daily. Not always is it possible to stop for repairs even when such leaks are discovered.

It is well to keep closely informed by tests, each watch, for chlorinity in the boilers, as, when this impurity mounts, a leak has developed. It then is wise to take such steps as may be possible, in the use of chemical compounds to render the sea-water as nearly harmless as possible. When it is considered that the magnesium chloride forms hydrochloric acid, under the effects of heat and pressure, in the boilers, the need for great care will be realized.

Properties of Fresh Waters

The range of impurity proportions in fresh waters is enormous, and boiler operators are concerned with the nature of these impurities as well as with their quantity.

One of the baffling problems in treatment is seasonable and unseasonable variations in the same sources of supply. For instance the Mississippi river will carry hard water in the late winter and late summer while it carries comparatively soft water in spring and fall or after heavy rains, this variation is even more pronounced in smaller streams.

In the far northwestern section of the United States there are water supplies almost totally pure; too pure for safe use in boilers without the addition of lime.

Some years ago the government boiler inspection bureau promulgated an arbitrary rule forbidding the railways to operate a locomotive boiler more than thirty days between washouts or more than four years between flue and tube renewals. That rule is still in effect despite the fact that in some sections they must be washed as many as fifteen times in thirty days of operation; and despite the

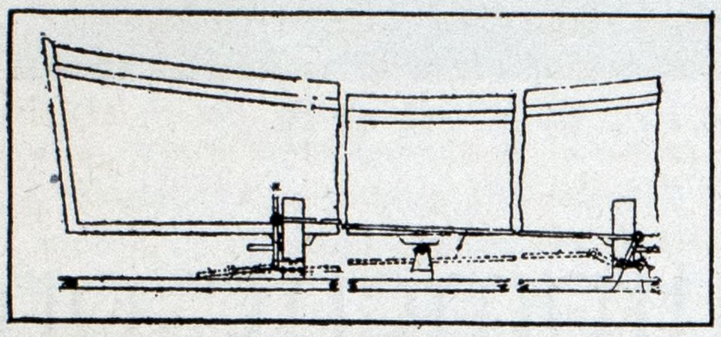
(*Continued on Page* 70)

Patents Show Marine Development

Latest Marine Inventions Described

Specially Prepared for Marine Review
By Richards and Geier
Patent Attorneys, 274 Madison Avenue, New York

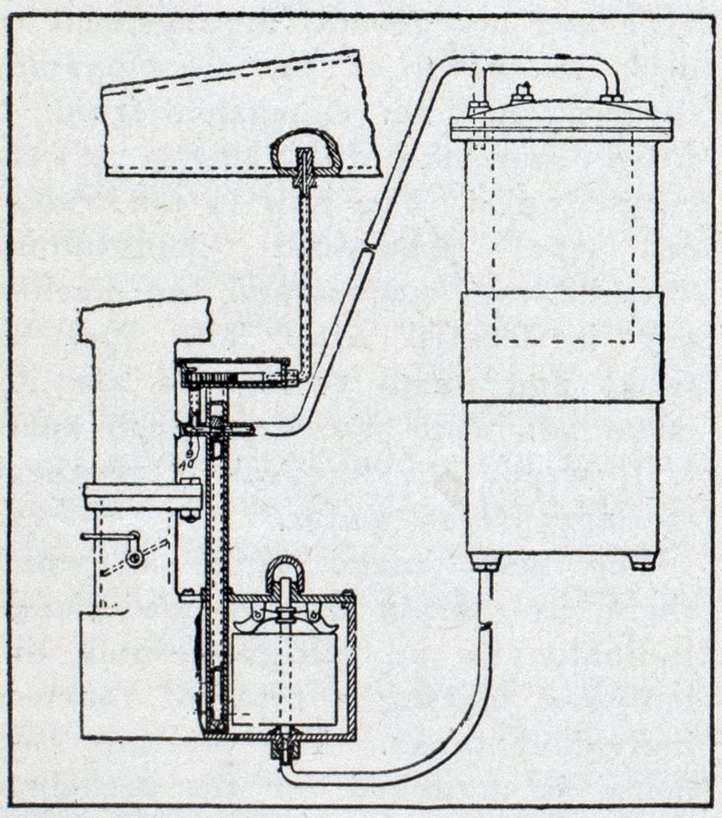
THIS invention has reference to movable chocks or supports for ships' boats, and it relates more particularly to that type which are movable in their beds or bases.



SHIP'S BOAT CHOCK OR SUPPORT

U. S. patent No. 1,714,437, issued May 21, 1919, to Daniel Roberts, of Bootle, Liverpool, England.

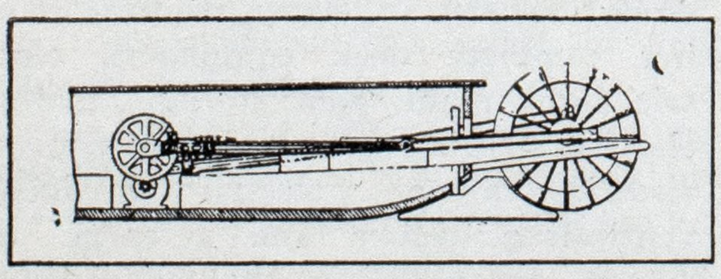
THE principal object of this invention is to provide means for automatically feeding a preliminary rich charge in order to start the engine, and thereafter automatically reduce the richness of the charge.



AUTOMATIC FUEL REGULATOR

U. S. patent No. 1,694,801. Charles Lawrence Stokes, Los Angeles, Calif., assignor to Curtis B. Camp.

THIS invention relates to power systems and especially to systems of electric ship propulsion.

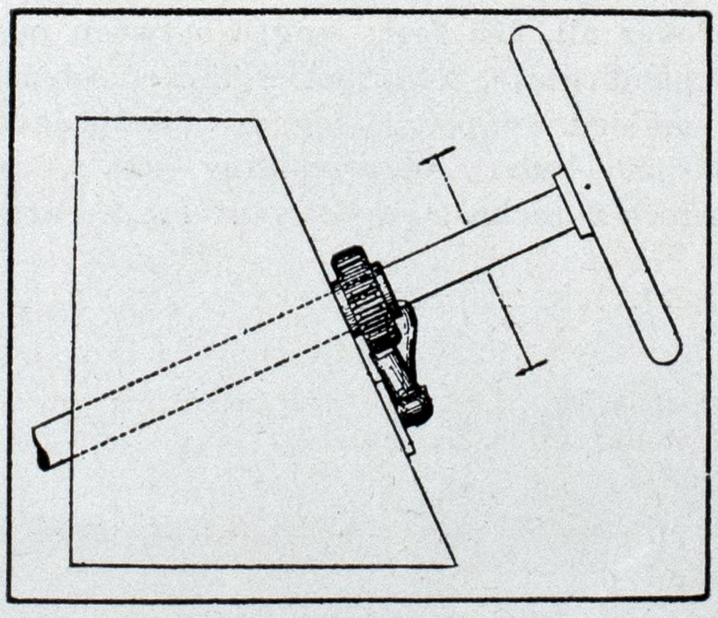


SYSTEM OF SHIP PROPULSION

U. S. patent No. 1,713,188, issued May 14, 1929, to Campbell Macmillan, of Schenectady, N. Y., assignor to General Electric Co.

WE HAVE made arrangements with the patent attorneys Richards & Geier, to publish data relating to letters patent issued in the United States covering inventions which may be of particular interest to our readers. The patents described, some of which have accompanying cuts partially illustrating the inventions, are all of recent date and we are planning, in subsequent issues, to publish similar information on patents pertaining to various phases of marine development work. Should our readers be interested in obtaining a printed copy of any of the patents appearing in this issue, or any other patent desired, such copies may be had by addressing request to the editor or directly to the contributors of this page.

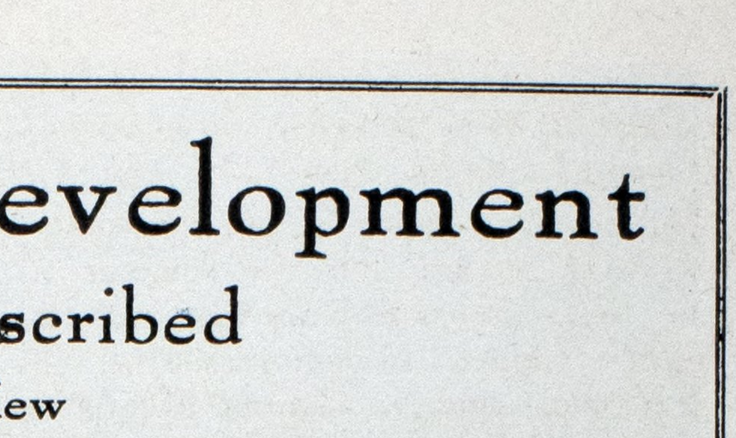
THIS invention relates to helm locking devices for vessels. According to this invention, a spur gear is rigidly mounted on the steering shaft and there is provided a locking pawl pivotally mounted, the end of which is adapted to engage the teeth of the gear. A handle is provided for operating the pawl, the handle being so arranged relative to the pawl that the latter is held in locking or unlocking position by gravity.



HELM-LOCKING DEVICE FOR VESSELS

U. S. patent No. 1,711,037, issued April 30, 1929, to George Bojer, of Huntington, N. Y.

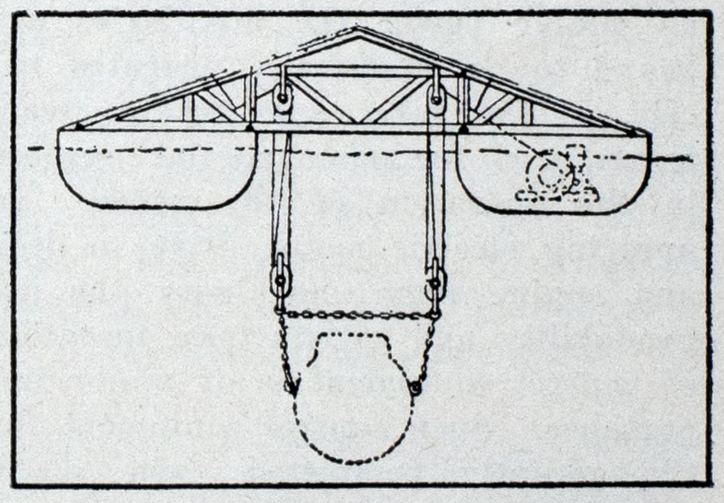
THIS invention relates to propulsion of boats by water jets, particularly those wherein the propulsion is by means of sheet jets from nozzles located on the entrance section of the boat in advance of and discharging through a region adjacent to the under-water body of the ship, beneath where the maximum bow wave tends to pile up, when the ship is proceeding at speed.



MARINE PROPULSION MEANS.

U. S. patent No. 1,698,822. Clifford M. Paxton, Piermont, N. Y., assignor to Paxton Corp. of America. Filed April 6, 1927. Serial No. 181,291.

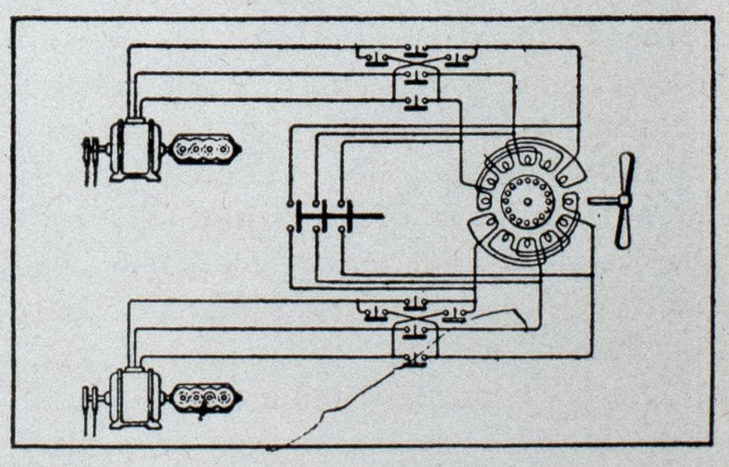
THE present invention relates to improvements in vessel raising barges and has for its principal object to provide a structure that is particularly adapted to be used in raising sunken submarines.



BARGE FOR RAISING SUNKEN VESSELS

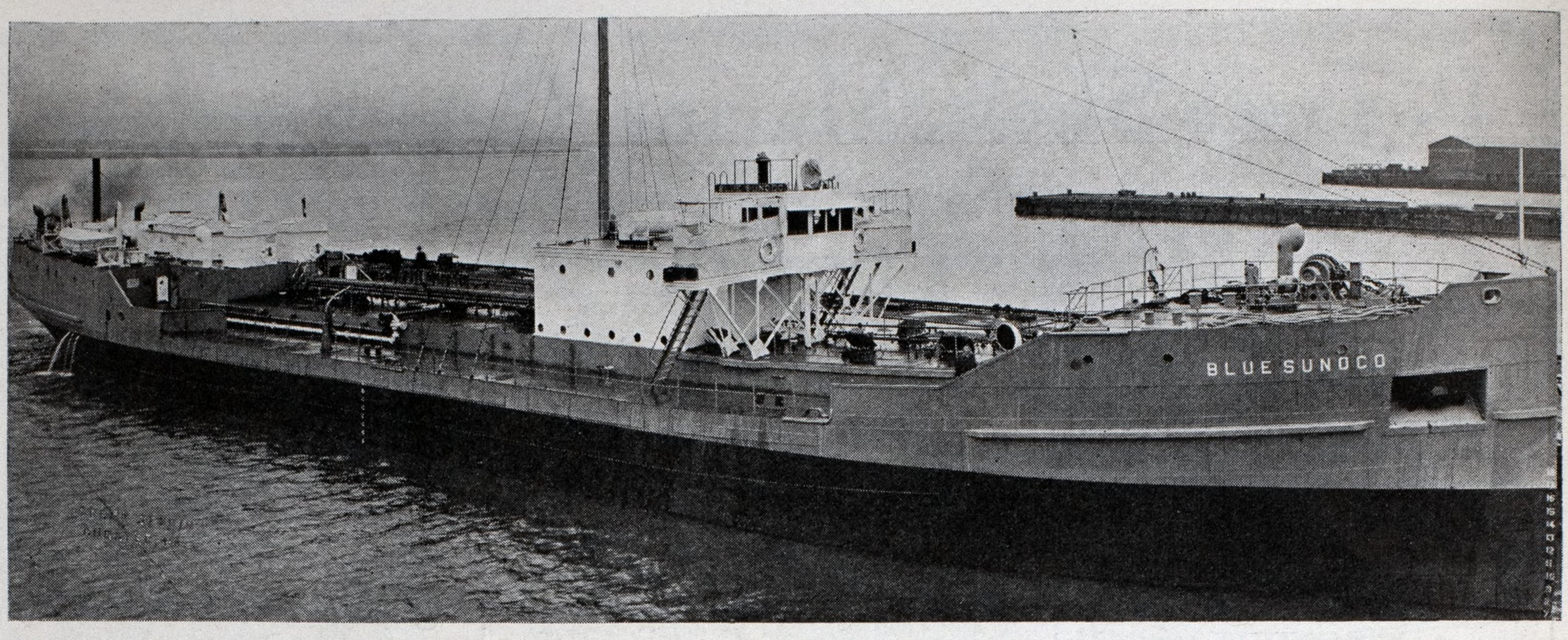
U. S. patent No. 1,715,291, issued May 28, 1929, to Edward Hisle, of Lexington, Ky.

THIS invention relates to power systems and more particularly to electrical ship propulsion systems utilizing a mechanical transmission through connecting rods to drive a propeller.



POWER SYSTEM

U. S. patent No. 1,714,908, issued May 28, 1929, to Charles L. Heisler, of Schenectady, N. Y., assignor to General Electric Co.



Twin Screw Motor Tanker Blue Sunoco Built by Sun Shipbuilding & Dry Dock Co. for the Sun Oil Co.

Electrical Control Equipment on Diesel Tanker Blue Sunoco

By Wm. Hetherington Jr.

PRACTICALLY every recently completed modern vessel is fitted with electrically driven auxiliaries. Where the diesel engine is used as motive power the auxiliaries are bound to be electrically operated except in the rare cases where steam is required for some special purpose in the operation of the vessel. In applying electric motor drive to deck and engine room machinery the dependability and satisfactory operation of control equipment is of major importance. Such control equipment for the recently completed twin screw diesel tanker BLUE SUNOCO will be described later in this article.

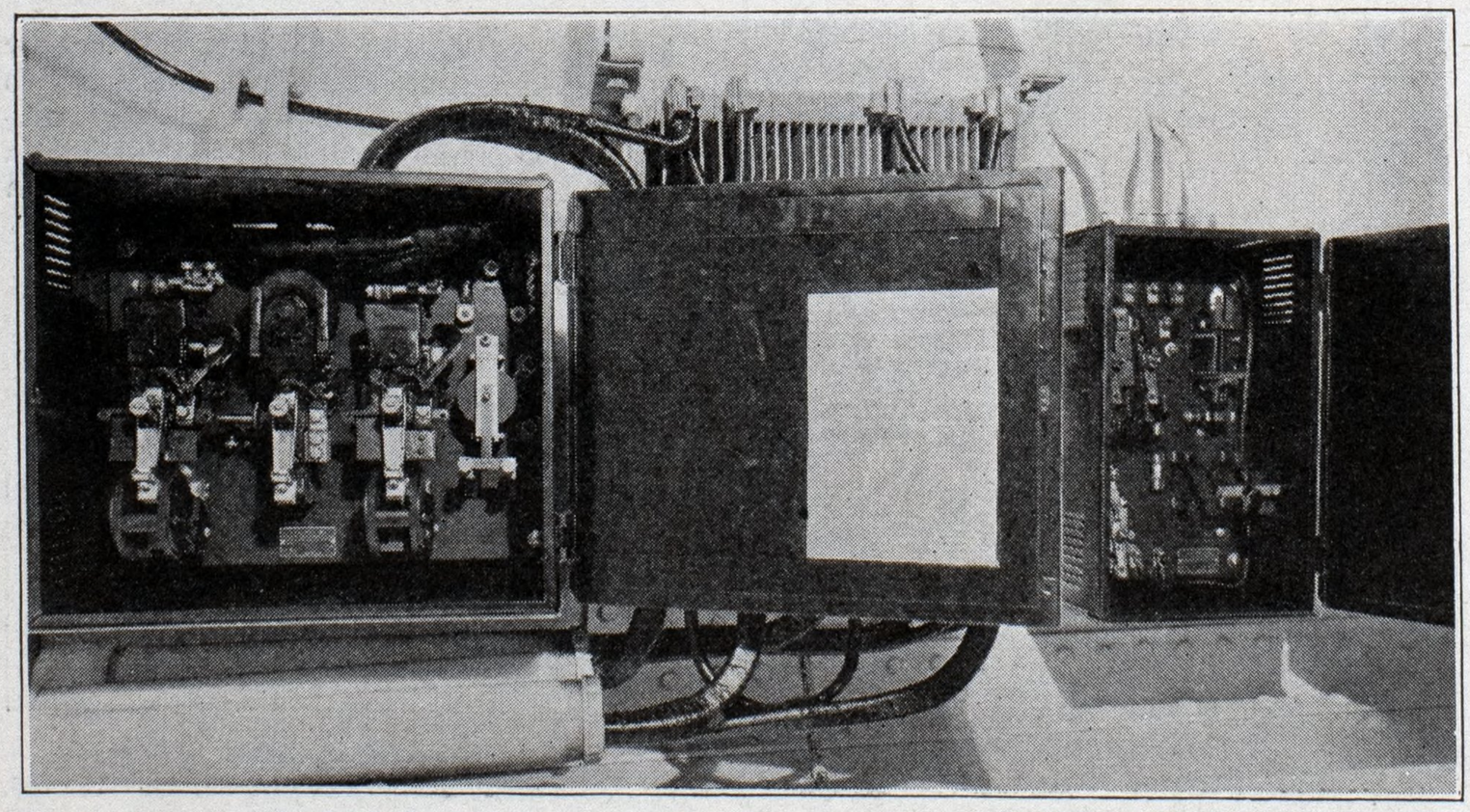
The twin screw motor tanker BLUE SUNOCO was built by the Sun Shipbuilding & Dry Dock Co., Chester, Pa., for the Sun Oil Co., Philadelphia. She was launched on April 6 and was completed April 12. She is intended for coastwise ocean service and also for use on the St. Lawrence river and the Welland canal between Montreal and the Great Lakes. Her principal dimensions are: Length over all, 255 feet; length between perpendiculars, 246 feet 6 inches; depth molded, 18 feet 6 inches; deadweight, 2350 tons; corresponding draft, 15 feet 6 inches; capacity of main cargo tanks, 20,000 barrels; speed, 9½ knots.

The BLUE SUNOCO is of single deck type and her general arrangement on deck is shown in an accompanying illustration. An expansion trunk is fitted over the full length of the cargo tanks. The hull is constructed on the Isherwood longitudinal "bracketless" system and the machinery is located aft. The fuel oil tanks and pump rooms are also located aft while the dry cargo space is forward. The forepeak is arranged to carry fresh water.

The main cargo tanks of which there are seven are divided longitudinally by an oiltight center line bulkhead making a total of fourteen individual tanks. The midship steel house is arranged for the accommodation of captain, officers, hospital and wheelhouse. The engineers, crew, messrooms and cold storage rooms are accommodated in the poop 'tween deck. All the rooms are large and well ventilated.

This tanker was designed as well as built by the shipyard and is entirely modern in every respect, having complete deck equipment, electric light plant, cold storage, hydroelectric steering gear, heating system, electric capstan, electric windlass, ventilating system and a cargo oil system arranged for the rapid loading and discharge of liquid cargo. She is built to the highest class of

The author, Wm. Hetherington Jr., is one of the leading marine engineers of Cutler-Hammer Inc. and is an expert on electrical control apparatus and its application to shipboard



CONTROL PANELS FOR WINDLASS AND FOR FORWARD BILGE PUMP CONTROLS

the American Bureau of Shipping.

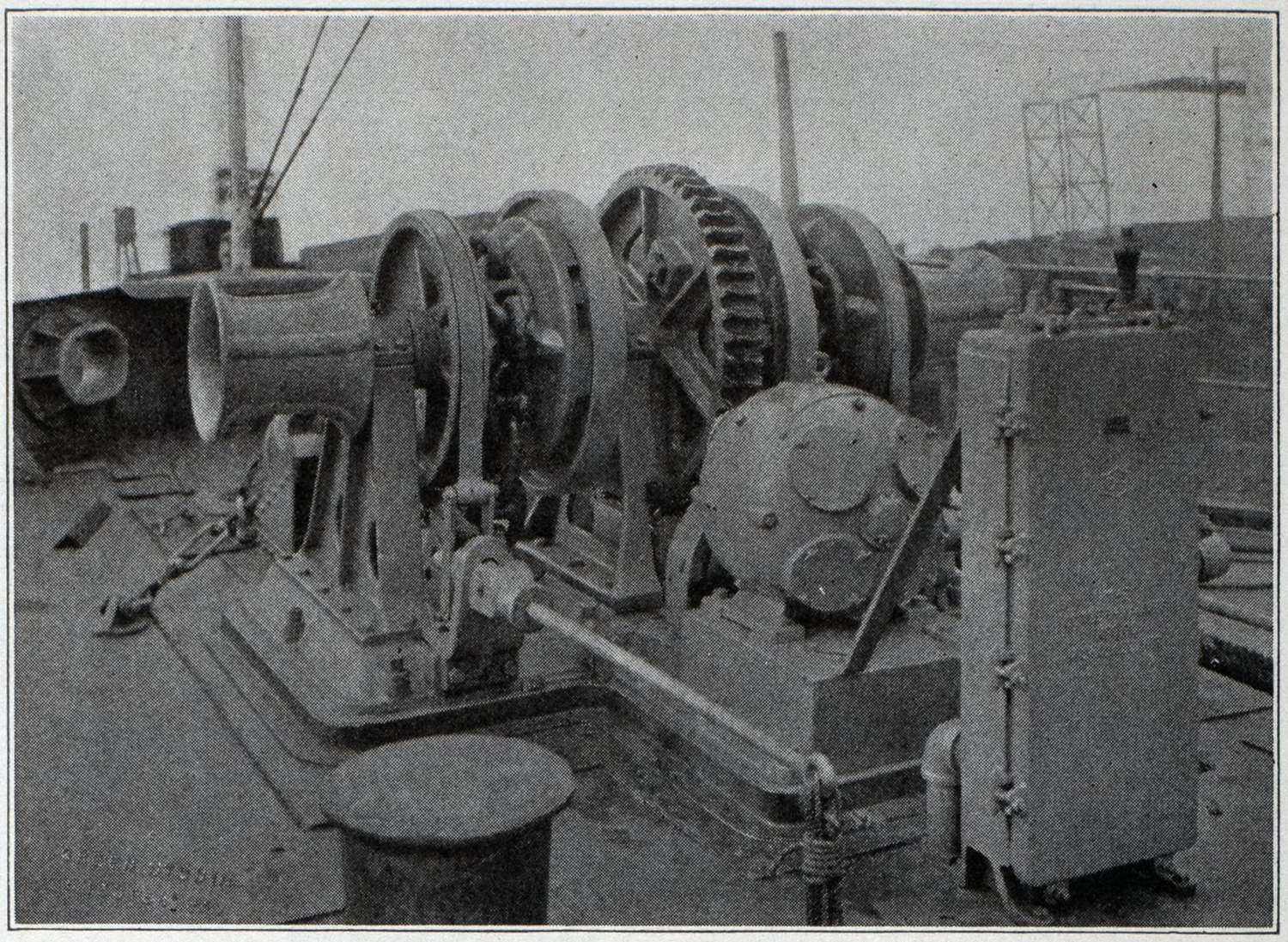
For a tanker of this size the engine room is most completely equipped. All of the engine room auxiliaries are independent, are electric motor driven, and are of dual capacity. The two main engines are Bessemer diesels, Model KR6, of 6 cylinders, developing 500 horsepower each at 275 revolutions per minute. They are direct reversible and of the one lever control type. The controls are located at the engine room floor level aft of the camshaft drive housing. The crankshaft of the engine is of unusual size, being ten inches in diameter, both pins and main bearings.

The equipment furnished with the engines is all motor driven and includes two 5 horsepower, all bronze, centrifugal water pumps, the capacity of either pump being ample for both engines. There are two 3-horsepower electric motor driven lubricating oil pumps and two 15-horsepower two-stage electric motor driven compressors. There are five air tanks 36 x 84 inches in size. The motor driven auxiliaries are all variable speed and with push button control. The only accessory integral with the main engine is the fuel oil system, complete with duplex fuel oil strainers and pumps.

Auxiliary generators, of which there are two, are driven by Bessemer diesels of 4 cylinders and 75 kilowatt capacity, 120 horsepower at 375 revolutions per minute. Special attention has been paid in the design and building of the main engines to facilitate the ease of cleaning cylinder jackets and heads. The lubrication oil system consists of duplex lubricating oil strainers, oil coolers, automatic cylinder lubricators and lubrication piping through the drilled crankshaft and connecting rod to wrist pins.

Cargo lines are of 8-inch diameter suction and discharge. There is a 6-inch bell mouth suction in each tank fitted with 6-inch gate valves operated from the deck. There are two 8-inch suction lines on each side of center line bulkhead running the full length of the tanks and properly cross connected to pumps in the pump room. The discharges at the pump room are two 8-inch lines port and starboard. For heating purposes there is a gas and oil fired boiler of 433 square feet heating surface.

The electrical control equipment on the BLUE SUNOCO was furnished by Cutler-Hammer Inc. The windlass located on the forecastle is of the worm gear type, electrically operated, made by the American Engineering Co. The electric motor, of 25 horse-



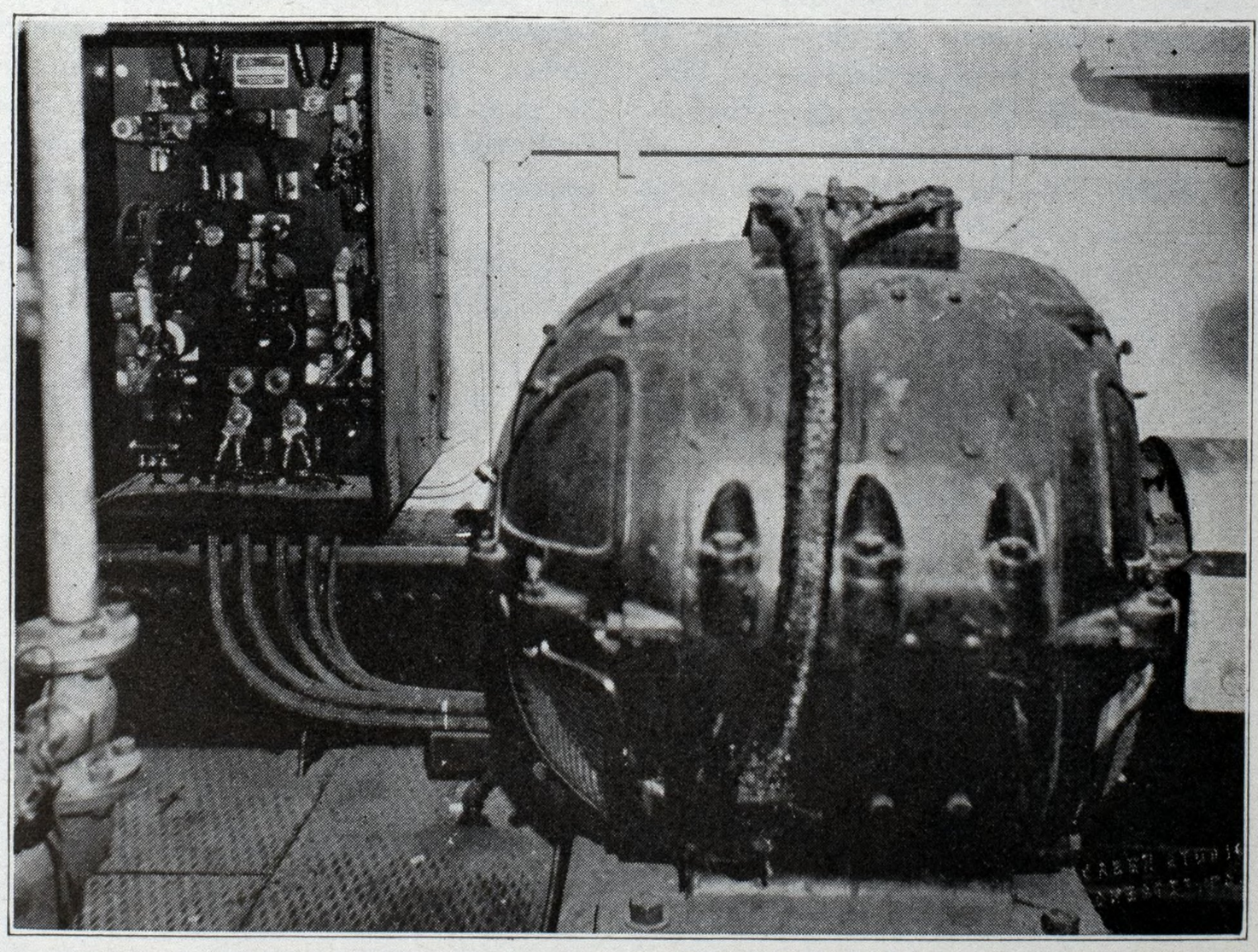
WATERTIGHT DRUM CONTROL FOR THE ELECTRICALLY OPERATED ANCHOR WINDLASS ON THE TWIN-SCREW DIESEL TANKER BLUE SUNOCO

power, built by the Electro Dynamic Co., is of the watertight type and is operated by a watertight drum type of control. The control consists of a watertight radial drive, reversible slow speed design, with separate non-watertight protected jam relay and low voltage protection panel with open type zinc plated grid resistors. The drum is mounted conveniently near the windlass as shown in an accompanying illustration. The protected panel with the resistors is mounted below deck in an unexposed location.

Located aft there is a capstan driven by a 10-horsepower motor of similar type to that for the anchor windlass, and a similar watertight drum type of control is used. A jam relay and low voltage protection are also provided for the capstan in a similar manner as for the windlass.

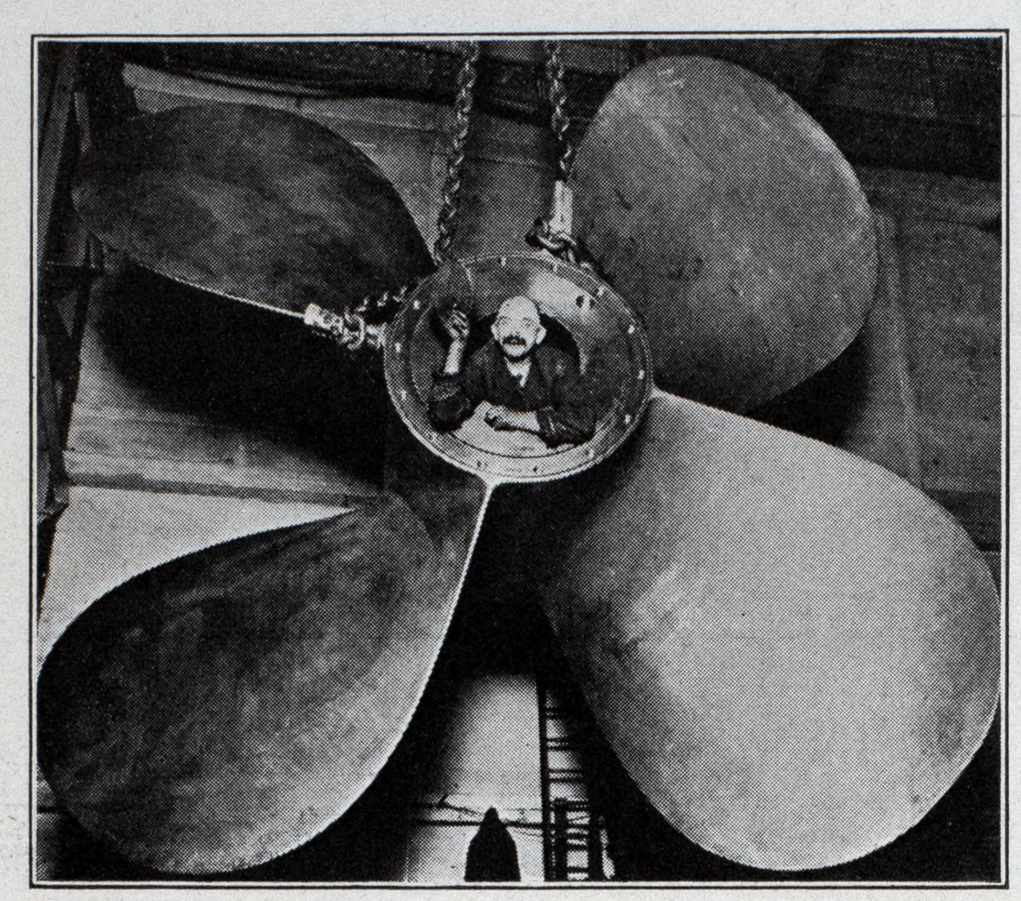
The main cargo pumps, two in number, were supplied by the Worthington Pump & Machinery Corp. These pumps are of the horizontal duplex type, are 12-inch stroke by 12-inch bore and are driven through reduction gears by 75-horsepower Electro Dynamic motors of drip proof type. The capacity of each cargo pump is 850 gallons per minute at a

(*Continued on Page* 72)



SEMIAUTOMATIC MAGNETIC CONTROL FOR PUMP MOTORS ON BLUE SUNOCO

Propeller for S.S. Europa



NOTHING could look more conventional or truly made to exact requirements than this bronze propeller, weighing 17 tons, one of four, which it is expected will drive the new North German Lloyd liner Europa at 27½ knots, a greater speed than ever before attained by a merchant ship. Made in England by J. Stone & Co. Ltd. at the Charlton Works.

Dollar Steamship Co. Is Awarded Loan

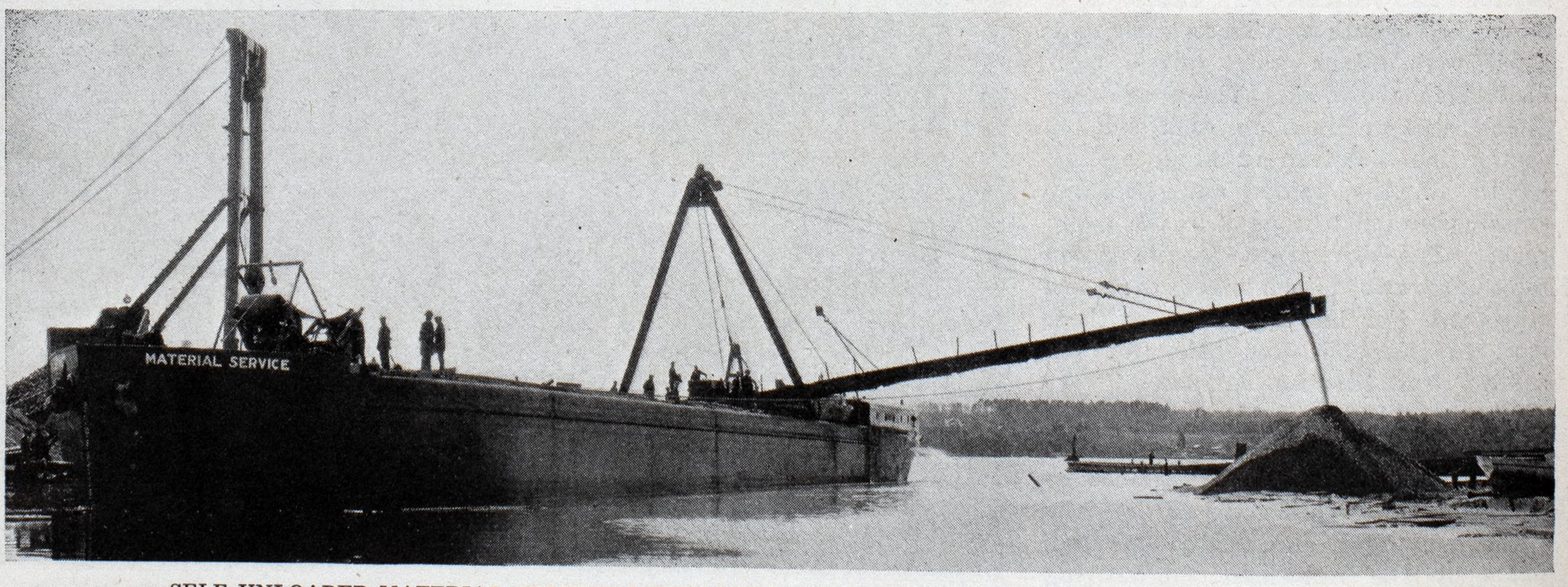
The Dollar Steamship Co., San Francisco, on May 29 was granted a loan in aid of reconditioning and improving four passenger-cargo vessels, the President Harrison, President Garfield, President Adams and one additional vessel to be chosen from the President Hayes, President Monroe and President Van Buren. The work involved includes fitting and furnishing of additional passenger accommodations in the four vessels and the installation in three of the vessels of deep tanks for the carriage of bulk oil. The total amount of the loan for the four vessels shall not exceed three-quarters of the cost of reconditioning and in no event shall exceed $1,125,000. Repayment of principal of each loan shall be made in 15 annual installments with interest at the low rates provided.

Self Unloader Goes Under Low Bridges

SINCE her completion in April the special self unloader MATERIAL SERVICE, so designed that she could pass safely under low bridges, has been in steady operation and has carried a half dozen cargoes between Lockport, Ill. and Chicago. The extreme high water prevailing at this time gave the operator something to think about in clearing the bridges. One of the accompanying photographs shows this vessel passing under the Michigan avenue bridge, Chicago, in ballast trim, with a clearance to the highest point above water of only 12 feet. In the original design her ballast tanks had been arranged to submerge her to an overall clearance of 13 feet. The water at this point is now so high that Chicago tugs are unable to pass under the bridges. It was therefore necessary in order to clear the bridges to carry about 300 tons of water in the cargo hold, which submerged the MATERIAL SERVICE to an overall clearance of 12 feet. The operator found that though this was not a part of the scheme of the original design it proved successful.

Another problem in the design of this vessel was in going down stream with the swift current in congested and restricted waters, with direct connected diesel engines as propulsive power. It was feared that it might be impossible to go slow enough and still maintain steerage way. In operation it was found that by working one engine ahead and the other astern which has the effect of maintaining a current on the rudders, it was possible to navigate at one mile per hour if necessary and still steer

The self unloader is driven by the port side main propelling diesel engine through a magnetic clutch. This arrangement was considered somewhat of an innovation. In actual operation, however, it has been found to work very well, even better it is said than the designer had hoped for. Still another feature is the use of compressed air in the operation of her intermittently used deck auxiliaries such as, anchor windlass, mooring winches, boom lifting and swinging engines and her towing com-



SELF UNLOADER MATERIAL SERVICE DISCHARGING SAND DURING TRIAL AT STURGEON BAY, WIS.

pany type of ram steering gear. Again, in actual operation, it was found that compressed air is satisfactory for use as power in standard steam deck machinery. Some trouble however was experienced in driving the air compressors with the diesel engines by means of chain drives.

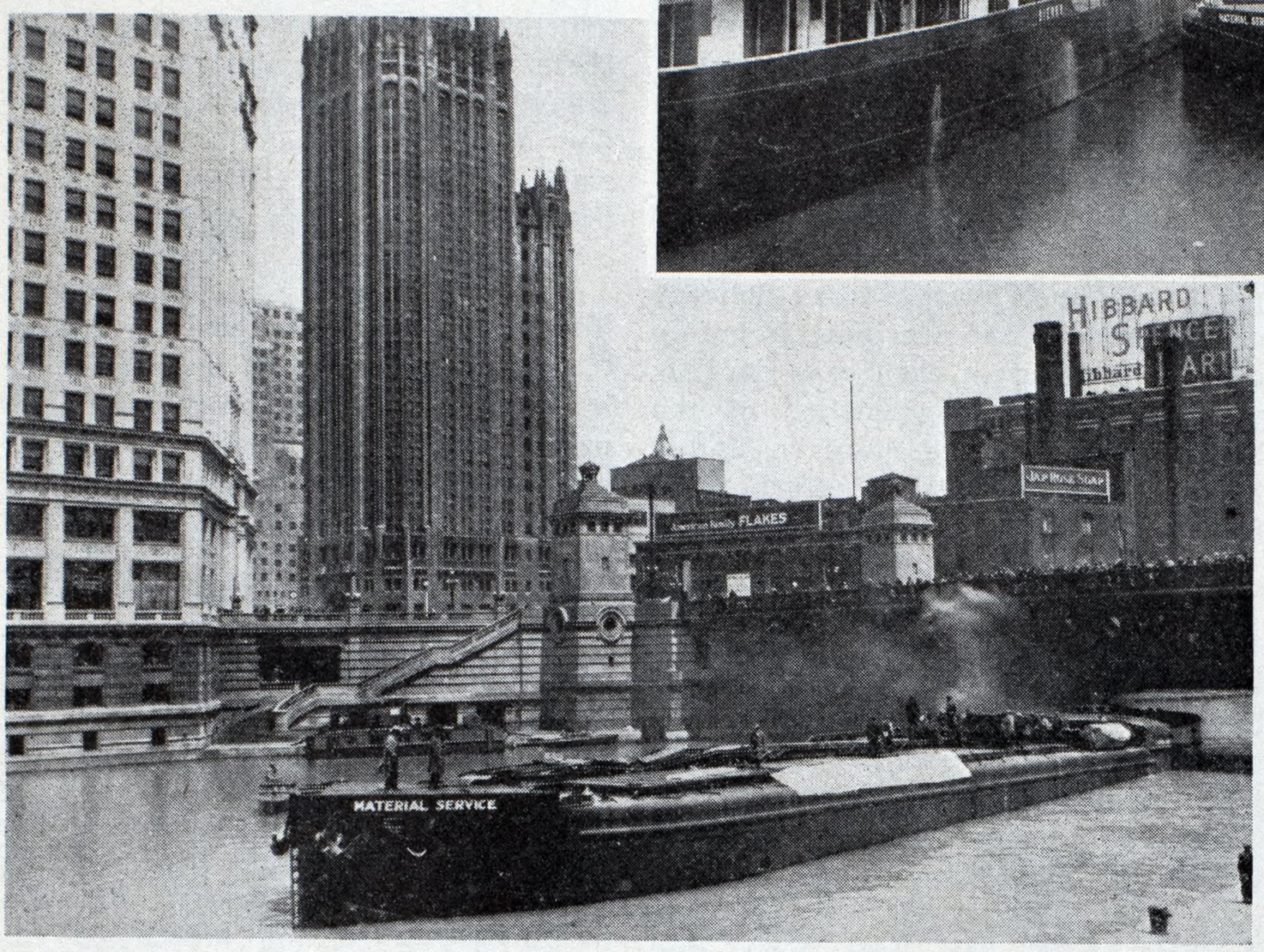
The loading of the MATERIAL SERVICE has been from the shore plant at Lockport, Ill. A partial trial load of sand was pumped at Sturgeon Bay, Wis. before leaving. With both engines in operation a speed of 10 miles per hour is possible while with only one engine it is possible to get a speed of 7 miles per hour. This vessel cost $350,000 and is the first boat of her size to pass under the fixed bridges across the Chicago drainage canal and to navigate the 34 miles of canal waterway from Chicago to Lockport, Ill.

One of the accompanying illustrations shows two of the latest self unloaders completed on the Great Lakes, one being the MATERIAL SERVICE and the other the S. S. SIERRA of the Tomlinson fleet. Both of these vessels were equipped, and one, the MATERIAL SERVICE was built throughout, by the Leathem D. Smith Dock Co., Sturgeon Bay, Wis. last winter.

The SIERRA is shown discharging sand, and the MATERIAL SERVICE gravel, over the truck tunnel on the new dock of the Material Service Co. at Chicago. Trucks drive through the tunnel and are loaded through gates in the roof which eliminates all handling of the material. This arrangement was designed by the Maritime Engineering Co., Chicago.



THE SIERRA AND MATERIAL SERVICE UNLOADING SAND AND GRAVEL RESPECTIVELY AT THE DOCK OF THE MATERIAL SERVICE CO., CHICAGO



SELF UNLOADER MATERIAL SERVICE PASSING UNDER MICHIGAN AVENUE BRIDGE, CHICAGO, IN BALLAST TRIM. CLEARANCE HIGHEST POINT ABOVE WATER 12 FEET

A detailed description of the twin screw diesel self unloader MATERIAL SERVICE appears on page 34 of the April issue of MARINE REVIEW. The vessel is built entirely of steel and is 246 x 40 x 15 feet 6 inches in overall dimensions. She is propelled by two Winton diesel engines each of 350 horsepower at 250 revolutions per minute. The patented self unloading equipment and also self loading and dredging equipment is of the Leathem D. Smith design. The cargo capacity is 2700 tons in sand or gravel. This cargo can be unloaded at a rate of 700 tons per hour.

The vessel is owned by Leathem Smith-Putnam Navigation Co. and is under a 10-year contract to carry sand and gravel for the Material Service Co. from its Lockport, Ill. plant to its docks at North Halstead street, Chicago and South Chicago.

Twin Screw Diesel Yacht Is Launched

THE twin screw diesel yacht HI-ESMARO, designed by Henry J. Gielow, Inc., for H. E. Manville, was launched June 7, from the yard of the Bath Iron Works Corp, Bath, Me. She is a steel vessel built to class 100 A1 at Lloyd's. Her length over all, without including the bowsprit, is 267 feet, on the waterline 216 feet, beam amidships 35 feet 3 inches, depth at lowest point to main deck 22 feet 6 inches. When loaded her draft will be about 15 feet.

This yacht is efficiently subdivided by transverse watertight bulkheads into six watertight compartments. She has a double bottom extending all fore and aft, and three deep tanks extending to her cabin deck. These tanks carry fuel oil and fresh water of sufficient quantity to enable the vessel to make long cruises. In all there are 24 water and oil tight spaces in the yacht. Where watertight doors are fitted in the bulkheads, means are provided by electric contact to indicate in the pilot house whether the doors are open or closed.

All of the decks in the yacht have steel beams, steel stringer and tie plates, and are supported by steel pillars. The main deck and the forecastle decks are plated entirely over with steel, on top of which a teak deck is laid. All of the deck houses are of steel, including the pilot house and chart room.

The two propelling engines are Bes-

(*Continued on Page* 40)

Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review
By Harry Bowne Skillman
Attorney at Law

THE settled rule is that no maritime lien for wages arises during the time a vessel is in custody of the marshal. However, seamen who rendered services on a ship for a considerable period of time, at the request of the owner and with the knowledge of the marshal, which were of benefit to the well-being of the ship, are entitled to recover the reasonable value of such services.—GEORGE W. GOETHALS, 27 F. (2d) 183.

* * *

IT IS the duty of the owner of a sunken craft, in a navigable channel, to immediately mark it with a buoy or beacon during the day or a lighted lantern at night and to maintain such marks until the sunken craft is removed or abandoned; but, where the government lighthouse service undertook to mark a wreck, the owner thereof was relieved from liability for damages to another vessel striking the wreck on account of failure to maintain marks required by statute.—Wilson v. Mitsui & Co., 27 F. (2d) 185.

* * *

THE local pilot custom on the lower Mississippi river is for the ascending vessel to come up under the points, in order to get the benefit of slack water, while the descending vessel runs the bends, keeping in or near the middle of the river, in the thread of the stream, to get the benefit of the current. This custom is of long standing, has received judicial sanction, and must be considered an exception to the pilot rules.—Crowell & Thurlow Steamship Co. v. Texas Co., 27 F. (2d) 208.

* * *

A BILL of lading accepted by a shipper upon delivery of goods to a carrier constitutes the contract of carriage between them. If the shipper delivers the bill of lading to another, and thereby transfers title to the goods, he is not relieved from the contractural obligations evidenced by the bill of lading. Nor does the carriers's delivery of the goods to the consignee necessarily have that effect. If, under the terms of the bill of lading, the shipper is primarily obligated to pay freight, demurrage, or other charges, the carrier may look to him alone, and need not enforce his lien on the goods, or seek payment from the consignee upon the latter's promise, inferred from his acceptance of the goods. The obligation of the shipper to pay such charges after delivery of the goods to the consignee is purely contractual, and in each case depends upon the proper construction of the bill of lading.—United States v. United States Steel Products Co., 27 F. (2d) 547.

* * *

UNDER a bare-boat charter a covenant to insure is not implied; the lessee is a bailee for hire with the obligation to return the boat in the condition received, necessary wear and tear excepted.—Cowles Towing Co. v. American Construction & Dredging Co., 27 F. (2d) 622.

* * *

INSURANCE "on liens p.p.i. and f.i.a." is valued insurance, which concludes the insurers as to the damages payable upon loss of the vessel. —Wendell P. Colton Co. v. New York & Cuba Mail Steamship Co., 27 F. (2d) 657.

* * *

SUBMARINES running on the surface through traffic lanes are not immune from the usual requirements regarding lights, said the court in the case of CITY OF ROME, 24 F. (2d) 729. The purpose of the regulations is to avoid loss of life and property. The strict observance by mariners of these or similar regulations have long been demanded by seafaring people. The character of the submarine and its method of operation are such that there seems to be more reason for further regulation of their operations than for relieving them from the rules applying to other vessels. The obvious answer to the contention that the nature of their construction and operation makes it impractical for them to comply with the rules is that if this be so they should confine their operation to waters not traversed by other ships. The fact that they are more dangerous should not be a reason for their disregarding rules which other ships must observe. If there were no regulations, the ordinary rules of negligence and care due other ships would require that ships should, by lights or some method, inform each other of their courses and speeds.

* * *

IT IS the duty of those in charge of the navigation of a vessel when in doubt of the proximity and navigation of another vessel, to slow or stop and reverse their engines.— CITY OF ROME, 24 F. (2d) 729.

* * *

A SEAMAN may assign his maritime lien for wages for adequate and fair consideration, and if there be no fraud or over-reaching on the part of the assignee the lien will be enforced in admiralty at the suit of the assignee. The assignment of the claim carries with it the lien as security for the debt, whether the lien be mentioned in the assignment or not.—PRESIDENT ARTHUR, 25 F. (2d) 999.

* * *

IF there is any reasonable doubt as to the proper navigation of a vessel overtaken, it should be resolved in her favor; it is the duty of the overtaking vessel to keep out of the way of the overtaken vessel and her tow, the overtaken vessel being privileged to keep her course and speed.—RELIANCE, 25 F. (2d) 625.

* * *

WHERE neither of two vessels which collided was on a steady course, but each was maneuvering, the sailing rules did not apply.—JAMES A. MCKENNA, 25 F. (2d) 639.

* * *

THE maritime lien is not to be given a broad legal interpretation, it was declared in the case of the PRESIDENT ARTHUR, 25 F. (2d) 648, nor is it to be extended by construction, analogy, or inference.

* * *

NO RULE of navigation requires a vessel to make known her maneuvers beyond the possibility of a mistake to a passing or crossing vessel. For the benefit of a vessel which was obliged to look and keep out of the way, no further action should or can be required.—Cranford, 27 F.

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	605	2,612,925	640	2,782,012
April	626	2,677,963	606	2,547,409
March	576	2,428,002	599	2,587,030
February	534	2,345,973	550	2,391,154
January	528	2,416,692	543	2,385,658
December	554	2,369,709	559	2,342,928
November	516	2,237,046	550	2,418,097
October	596	2,666,360	589	2.571,403
September	545	2.424.887	543	2.362,154
August, 1928	580	2,533,877	622	2,733,727

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	126	343,548	75	191,192
April	118	318,240	76	194,158
March	117	309,283	81	208,080
February	98	263,790	56	163,324
January	86	243,505	63	187,612
December	106	309.214	72	213,261
November	88	229,598	36	89,931
October	91	250,902	48	137,352
September	84	238.284	43	122.389
August, 1928	96	266,104	58	161,365

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	139	343,990	113	286,147
April	125	328,493	87	221,533
March,	90	305,532	59	209,077
February,	96	289,629	58	196,264
January	94	294,036	47	164,132
December	100	312,100	69	214,047
November	107	315,954	74	214,574
October	112	347,432	72	221,761
September	113	383.749	77	245.068
August, 1928	130	340,569	107	270,757

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	24	39,080	25	39,830
April	20	45,922	21	48,999
March	15	36,185	15	38,415
February,	19	46,400	17	46,121
January	20	59,830	21	61,434
December	25	61,251	25	62,930
November	20	37,250	19	32,408
October	23	39,959	22	40,588
September	30	53,338	30	51,018
August, 1928	30	48,256	28	47,078

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	11	39,061	5	18,506
April	5	20,267	5	17,898
March	5	19,121	5	21,902
February	2	5,891	4	17,323
January	7	24,095	4	17,289
December	6	20,741	8	32.974
November	10	35,147	9	20,551
October	6	14,667	9	20,551
September	5	18.895	3	12.777
August, 1928	7	28,611	4	19,978

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	26	98,630	48	172,196
April	36	136,793	47	169,257
March	45	170,528	64	232,651
February	35	137,304	48	181,425
January	27	105,843	50	181,584
December	39	144,128	56	205,572
November	30	115,469	53	198,195
October	42	154,623	62	224,018
September	41	150,368	57	203,758
August, 1928	35	136,504	47	172,693

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	155	478,043	155	465,843
April	158	471,851	156	465,710
March,	131	401,217	138	426,539
February	127	397,147	132	410,667
January	126	386,102	122	372,302
December	127	392,832	134	400,355
November	134	412,100	134	417,523
October	133	402,263	131	406,142
September	119	374,500	128	396,749
August, 1928	133	404,303	144	440,016

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	29	80,599	89	228,221
April	20	54,399	73	215,664
March	22	55,442	84	217,780
February	20	55,902	58	155,238
January	18	36,737	61	154,970
December	32	73,123	90	223,258
November	19	58,171	77	209,023
October	12	33,817	66	173,729
September	21	64,366	69	178,508
August, 1928	19	50,096	83	208,639

Jacksonville

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	12	24,974	12	26,010
April	15	33,734	13	27,662
March	20	25,950	16	21,897
February	17	27,851	9	13,422
January	16	19,754	14	28,046
December	13	17,657	7	9,510
November	26	64,406	27	67,621
October	23	55,147	22	53,094
September	40	89,032	42	94,981
August, 1928	37	85,186	34	83,694

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	99	110,911	100	110,658
April	79	77,934	75	77,672
March	77	82,370	76	96,935
February	84	104,667	73	90,947
January	82	98,373	79	99,243
December	79	79,816	72	79,354
November	98	81,666	101	82,863
October	120	111,450	116	106,139
September	84	60,079	86	62,698
August, 1928	91	73,771	89	69,532

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	89	211,519	75	168,343
April	102	213,941	77	174,116
March	102	220,251	105	264,084
February	85	202,594	69	164,847
January	83	186,978	79	168,403
December	100	234,963	89	212,341
November	91	203,865	77	184,537
October	89	185,031	71	166,606
September	85	209.709	74	193.661
August, 1928	90	186,097	78	178,036

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	51	216,463	53	221,564
April	62	264,744	61	254,647
March	57	234,394	59	248,901
February	53	222,462	55	225,789
January	60	242,464	73	290,077
December	62	249,729	63	259,823
November	68	285,564	75	306,605
October	62	245,420	60	243,778
September	57	229,718	66	254,503
August, 1928	55	220,858	53	228,378

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	289	758,671	277	717,581
April	294	751,444	278	708,155
March	283	773,515	298	517,632
February	248	682,052	249	675,432
January	273	710,969	282	744,078
December	274	762,019	260	690,010
November	252	690,157	263	716,105
October	259	682,184	329	627,989
September	228	617,636	248	661,643
August, 1928	264	667,055	265	690,341

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net. tonnage	—Clearances— No. ships	Net tonnage
April, 1929	24	62,976	26	62,467
March	14	37,470	18	46,087
February	26	78,237	26	66,648
January	23	54,709	25	57,589
December	20	46,569	17	43,041
November	22	56,983	22	50,043
October	24	59,136	26	61,673
September	21	60,956	22	54,537
August	24	62,574	26	63,874
July, 1928	26	59,204	27	61,976

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	37	79,121	79	220,456
April	36	82,330	93	294,062
March	33	62,486	77	221,143
February	37	96,127	81	256,077
January	45	133,396	106	347,297
December	45	129,285	107	355,592
November	49	150,205	109	351,063
October	41	110,825	135	420,534
September	26	69,433	98	313,816
August, 1928	31	91,959	78	261,804

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	167	604,274	224	597,519
April	175	546,939	184	650,172
March	177	572,573	180	523,807
February	150	470,851	157	484,043
January	193	581,357	191	536,504
December	199	551,301	154	487,064
November	209	541,906	179	514,647
October	221	568,910	216	515,889
September	188	504,630	189	482,133
August, 1928	164	539,454	160	514,978

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	179	643,864	165	613,836
April	173	673,174	153	606,246
March	176	655,851	174	692,407
February	153	603,008	130	484,085
January	135	587,423	142	560,239
December	155	607,902	152	582,612
November	157	504,269	157	589,810
October	165	620,117	155	596,750
September	180	623.999	175	579.262
August, 1928	185	674,832	164	643,965

Port Arthur

(Including Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
May, 1929	22	76,344	26	87,941
April	21	79,267	23	81,991
March	25	76,152	27	81,778
February	16	53,310	21	68,705
January	22	68,758	24	76,496
December	21	65,710	14	43,776
November	23	71,313	23	69,425
October	19	58,857	19	58,686
September	22	73,785	24	79,696
August, 1928	25	78,765	23	72,389

Note: The figures given in this table are for direct entrances and clearances. Additional vessels in foreign trade enter and clear from and to other American ports after original entry and before final departure. At the port of Philadelphia, for instance, additional vessels in the foreign trade in this category were 62 of 217,301 net tons entered and 65 of 228,412 net tons cleared for the month of May.



Modern Stevedoring and Dock Management

Practical Ways to Cut Costs in Cargo Handling

How to Improve Service to Ships

Conducted by H.E.Stocker



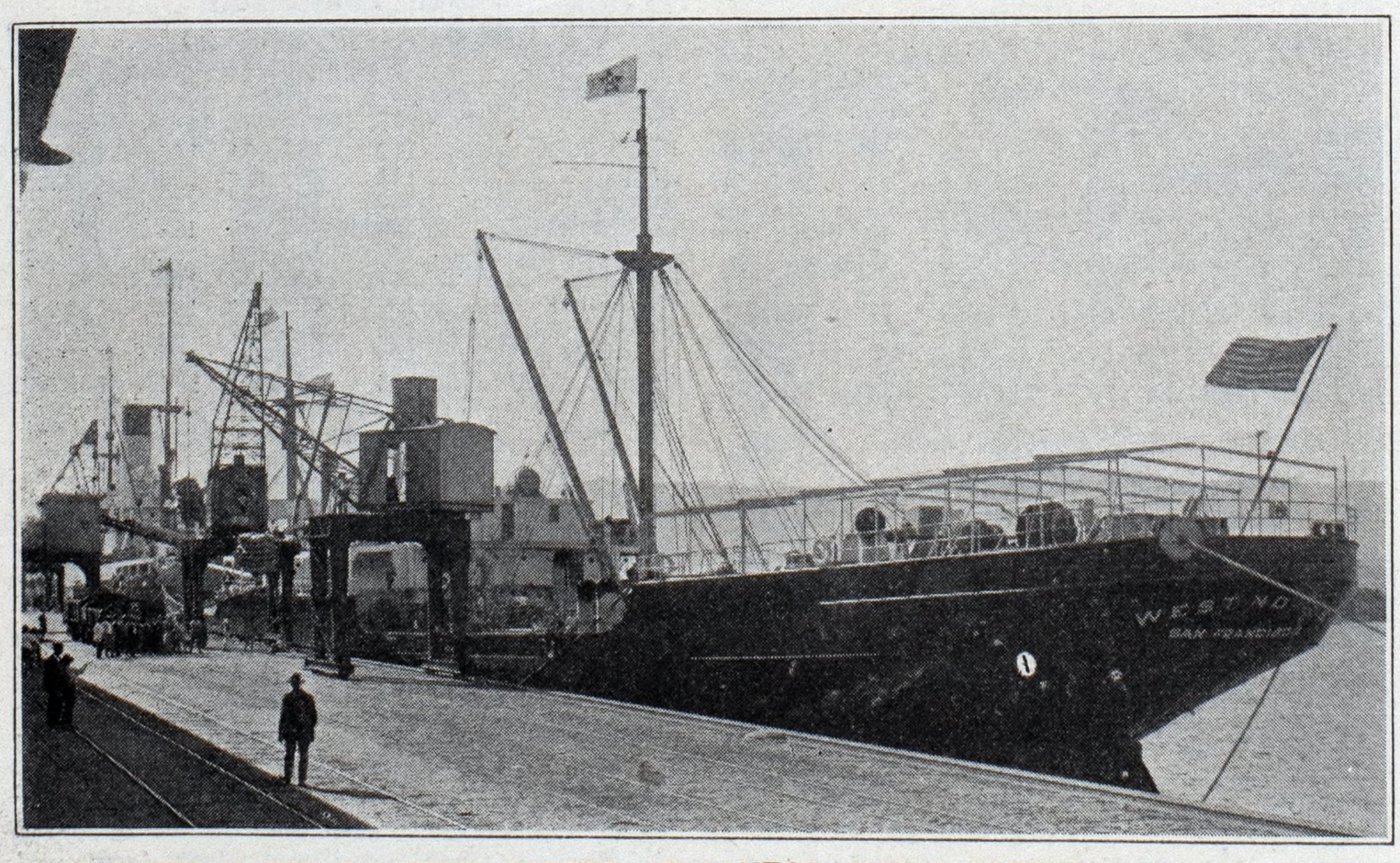
Conveyor Expedites the Loading of Coffee at Brazilian Port

SANTOS handles approximately 11,000,000 bags of coffee a year, of which about half comes to the United States ports. The coffee arrives at Santos from the interior by railroad, and is taken to warehouses about the city and to warehouses back of the cargo sheds along the quays. The approximate total storage capacity of the warehouses is 5,000,000 bags. As the order for coffee is received, it is brought in from the various warehouses about the city to the warehouses back of quays by mule or donkey drawn carts, as well as by motor trucks with or without trailers.

The carts and motor trucks are unloaded by hand, the laborers carrying the coffee on their backs into the warehouse. Tiering is accomplished by providing portable staircases which the laborer climbs with a bag of coffee weighing 132 pounds.

The problem of handling such a large quantity of uniform packages from the warehouses to the docks suggested a conveyor system, a method of handling which has done so much to reduce costs in our manufacturing industries, particularly in the automobile industry.

When a steamer starts to load, the bags are carried to holes in the warehouse floor which feed a belt conveyor running through a subway from the warehouse to the steamer alongside the quay. Last minute shipments are taken from the street vehicles and dropped into holes in the streets between the warehouses.



S. S. WEST NOTUS LOADING COFFEE AT SANTOS—USING ELECTRIC CONVEYOR FOR HATCH NO. 2 AND SLINGS FOR HATCHES NOS. 3 AND 4

Conveyors from Warehouse to Wharf

The conveyors running from the warehouses rise out of the conveyor subway and connect at right angles with a conveyor that runs along the outside of the cargo shed on the quay. These conveyor lines are protected from the weather by an overhang of the roof of the shed. A covered way has been provided where the conveyor lines run across the open space between the cargo sheds.

From this conveyor line the bags are switched to another line running at right angles by a man operating at the junction point. This conveyor line runs through a movable tower, which is moved electrically on rails up and down the quays to accommodate the ship loading. This is well illustrated in one of the accompanying pictures. The conveyor is divided into sections so that coffee may be diverted in either direction. The conveyor running from the tower to the ship, which can be raised or lowered according to the requirements of the ship loading, is dropped to a point a few feet above the deck of the ship. Sufficient bags of coffee are dropped to the deck at the end of the conveyor line so that the stevedores may build up a pile of

bags. Interspersed between the bags are reeds with edges protruding a few inches to protect the bags from chaffing, as the coffee drops out of the conveyor. A pyramid shaped pile is also built up in the hold by use of the ship's cargo gear. This pile breaks the fall of the bags coming through on the conveyor and causes them to roll away from the square of the hatch, facilitating stowage.

Traveling Cranes Are Also Used

The number of conveyor lines is limited, and as the mail and passenger steamers are given preference in their use, some hatches are worked with the electric full arch gantry cranes with which the terminal is equipped. Five of the gantry cranes are of 5-ton capacity (metric) and 28 are of 1½-ton capacity (metric). The power is obtained from a power plant owned by the dock company, which also supplies the city of Santos with power and light.

Coffee for these cranes is brought to the custom barrier by carts and by motor trucks. The custom barrier separates the cargo sheds from the street and from the warehouses. The bags are picked up at this point by the stevedores and are dumped within reach of a crane, a distance which at times is as much as 200 feet. Here the bags are made up into slingloads with a rope sling. The crane lifts the slingload, swings it over the deck of the ship and lowers it. The stevedores then attach the ship's gear and drop the slingload into the hold. This extra operation is necessary because the cranes have not sufficient reach to handle the cargo into the hold. Sometimes the ship's gear deposits the load on the hatch covers and the stevedores dump the bags into the hold.

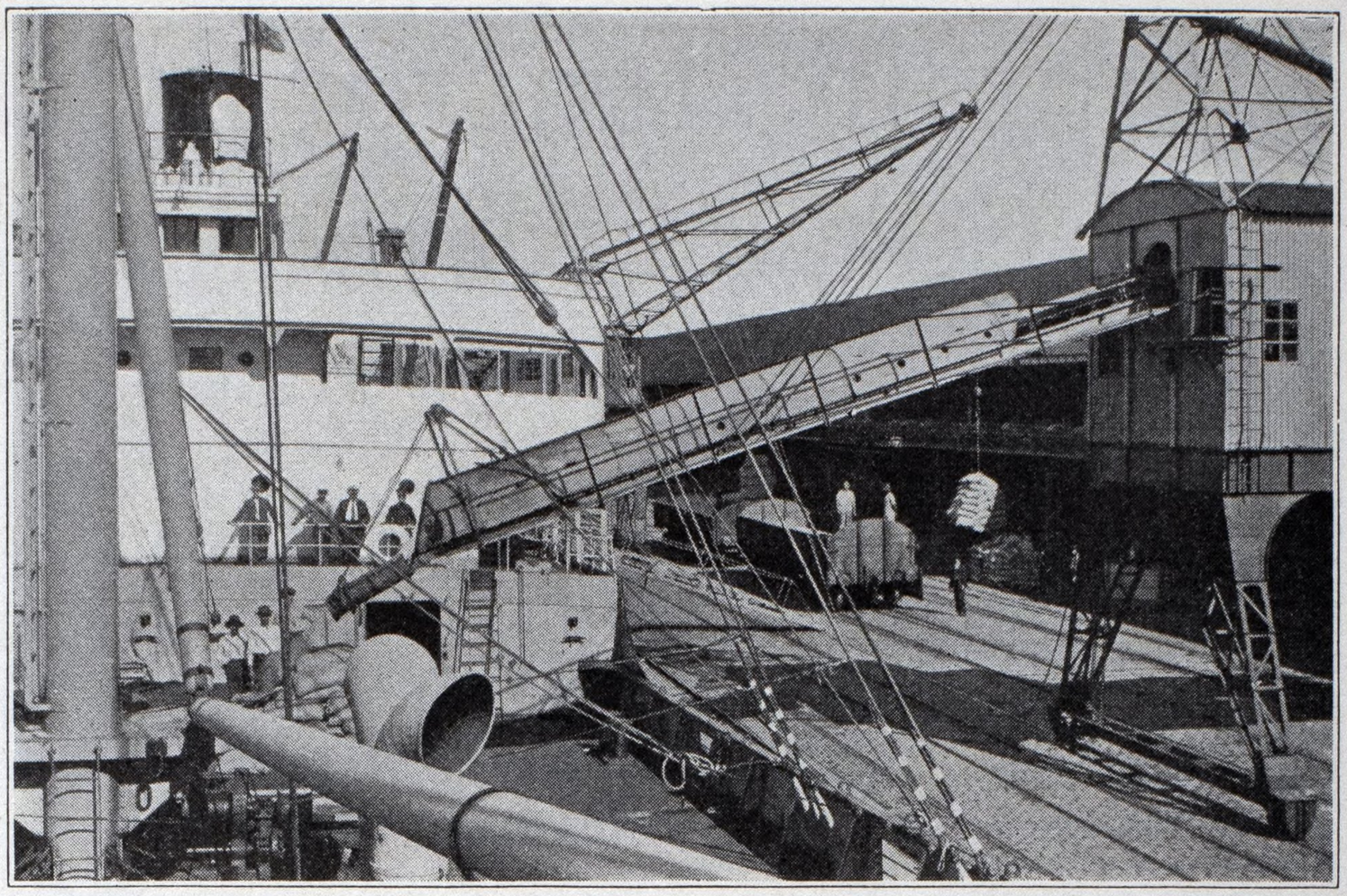
The crane and ship's gear systems handle about 500 bags an hour as compared with about 1000 bags per hour handled by a conveyor.

One ship loaded 80,000 bags of coffee in two days, using two conveyors and working the other hatches with the crane and ship's gear.

The conveyor method of handling cargo expedites dispatch of the ship at Santos, but slows it down at port of discharge, due to the mixing of marks which results.

The bags of coffee are fed into the conveyor system from several different piles at the same time, so that the stream of bags falling into the hold is made up of a number of marks. A steamer, discharging recently at New York, had 12,500 bags in one hold which were divided into 50 marks, resulting in 6 to 9 marks in a slingload of 14 bags.

The marks of coffee handled by



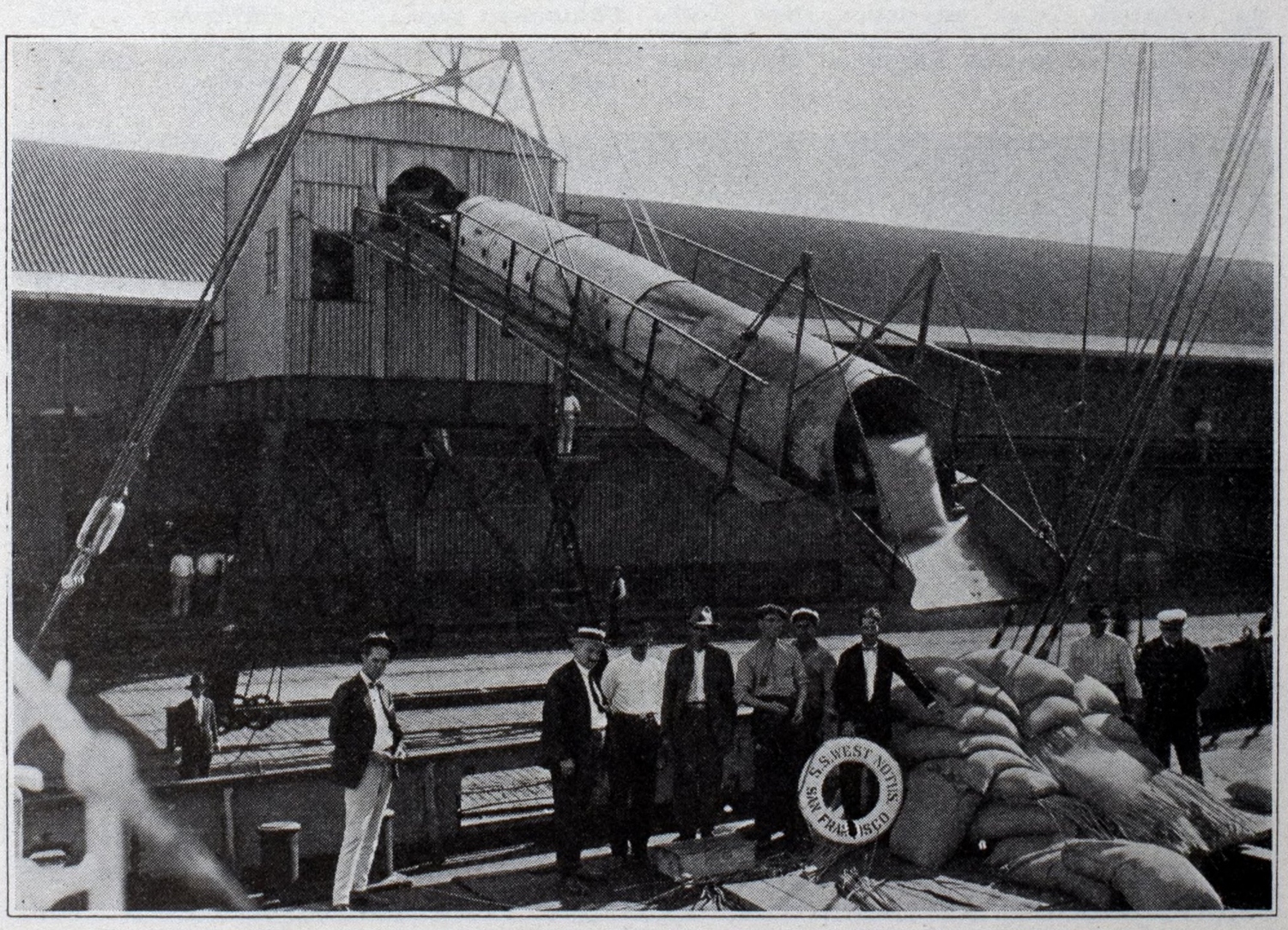
ELECTRIC CONVEYOR LOADING COFFEE ON THE S. S. WEST NOTUS AT SANTOS.

crane are also mixed. The carts are kept in line at the custom barrier and usually a shipment is scattered among the carts at various points in the line.

WHERE a uniform cargo in large quantities is to be handled either to or from a vessel a conveyor system would seem to be the proper method for expediting the transfer. With a gantry crane on the dock in conjunction with the ship's gear in the case described in this article only half as much cargo can be handled as with the conveyor. But there are practical limitations to the exclusive use of the conveyor system throughout. Step by step development of mechanical gear for reducing the labor and the cost of handling all commodities must come if shipping is to keep pace with the increasing efficiency noted ashore.

This mixing of marks complicates the use of mechanical equipment in discharging. Tractors, trailers, skids and lift trucks have been used in handling flour and beans from the Pacific coast where there are not as many marks to contend with. Experiments are under way to work out this problem so as to reduce costs and expedite ship's discharge. One line is giving consideration to the use of conveyors for taking the coffee out of the ship and sorting the bags by hand as they leave the conveyor. This is now done at Havre, France.

Experience elsewhere in the use of conveyors should be studied and to assist in this MARINE REVIEW will have future articles on the use of conveyors in handling various classes of package freight.



CLOSER VIEW OF THE CONVEYOR SHOWN IN THE OTHER ILLUSTRATIONS

Maintain Tractor Equipment for Best Performance Results

By C. B. Crockett

PROPER maintenance of vessels and their equipment has been found to pay dividends to the shipping industry for many years. Although appearance counts, it is the lower depreciation, insurance against failure and interruptions to service and the elimination of costly repairs which have made the care of everything on a ship a matter of such prime importance to the shipowner.

It is sometimes wondered if the same care is given to the equipment which is on shore, particularly to electric trucks and tractors which load and unload these same ships. The electric industrial truck has established a reputation for ruggedness, which perhaps has led to neglect. The more simple a piece of equipment the less maintenance it requires, but it is nevertheless true that some attention given this type of equipment will show surprisingly high returns.

Probably the storage battery industrial truck requires as little attention as any piece of equipment used by the shipowner. The very simplicity of its design—a battery, a motor, a set of gears and a controller—makes the task of maintenance a simple one compared to equipment in the engine room for instance.

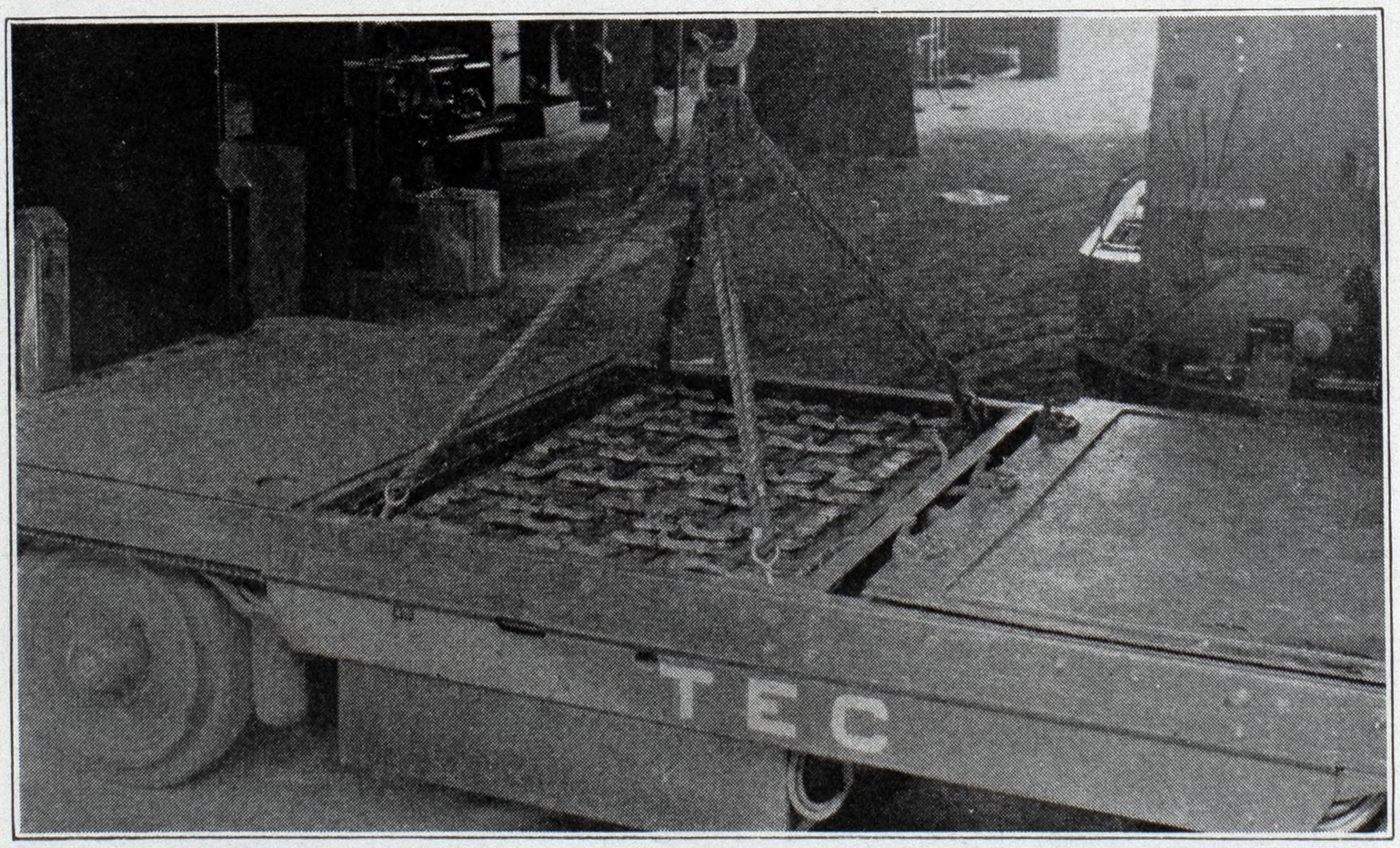
The author, C. B. Crockett, is the secretary of the Industrial Truck association, New York. This article was written for the Dock Management section of MARINE REVIEW at the request of the editor.

But even a motor or set of gears will not perform satisfactorily without

Service Record of 21 Electric Tractors

Total truck hours of operation	85,395
Total truck hours ready but idle	41,664
Total truck hours servicing and maintenance charging batteries, etc.	7,931

	Total Cost	Cost per Hour of Operation
Repair labor	$3859.99	.045
Repair material	3646.59	.043
Maintenance labor	6.59	.000
Maintenance material	8.89	.000
Supplies	109.29	.001
Storage battery maintenance and repairs	511.76	.006
Total Maintenance and Repairs	**$8143.11**	**.095**
Total Electric Current Costs	**$3781.35**	**.045**
Electric light	55.44	.001
Auto truck	1.06	.000
Shop overhead	84.46	.001
Stores adjustment	161.60	.002
Accident and hospital	569.57	.007
Total Plant Overhead	**$872.13**	**.011**
Tractor depreciation	3806.25	.030
Battery depreciation	9409.92	.075
Charging equipment depreciation	812.50	.006
Interest on the investment	4170.00	.033
Total Fixed Charges	**$18198.67**	**.144**
Foremen, clerks, operators and helpers	$51329.13	.601
Extra pay and learners	18.83	....
Miscellaneous labor	1645.99	.019
Total Operators Labor	**$52994.55**	**.620**
SUMMARY OF TOTAL COSTS		
Maintenance and Repairs	8143.00	.095
Power Costs	3781.35	.045
Plant Overhead	872.13	.011
Fixed Charges	18198.07	.144
Equipment Cost	**$30995.26**	**.295**
Operators Labor	**52994.55**	**.620**
TOTAL COST	**$83989.81**	**.815**



MULTIPANEL CHARGING EQUIPMENT INSURES PROPER CHARGING OF EACH BATTERY AND REQUIRES NO ATTENTION AFTER TRUCKS HAVE BEEN PLUGGED IN ON LINE

fresh grease or oil, controllers must have fingers replaced and the few simple rules suggested by the manufacturers of storage batteries will, if followed, increase the life of the cells far over that guaranteed.

Regular Inspection Necessary

There may be peculiarities in the marine field regarding handling methods and some argument as to whether certain methods common in industrial plants could be applied in the shipping industry. It cannot be contested, however, that if the same kind of equipment is employed in both instances that a comparison of the operating and maintenance costs of such equipment may be made. For that reason the writer has purposely chosen examples from industry in general as well as the shipping field.

Before discussing the cost of maintenance and other operating expenses it might be well to outline briefly the essentials which insure satisfactory performance of this equipment. Maintenance of the truck itself includes the periodic inspection of bearings, gears, brakes and controller. Gears and bearings should be periodically cleaned thoroughly with kerosene and refilled with clean grease. Brakes and bearings should be taken up as required, particularly after a new truck has been in operation for a little time. Controller fingers are quickly and easily replaced and should be inspected regularly. If a truck is constantly overloaded this fact will often be revealed in the condition of the contactors and the operator should be checked.

Care of the batteries includes proper charging, testing, flushing, cleaning and maintenance of the electrolyte at proper level and strength. Nothing is as dependable as a storage battery when given a minimum amount of attention and no piece of equipment is as abused by utter lack of care. No better manual can be found than the suggested rules furnished by the two leading manufacturers of storage batteries and these may well be posted in a conspicuous place near where the trucks are charged.

Nearly all modern industrial installations provide for the charging of

batteries by automatic equipment. This method has a three-fold advantage; first, it properly tapers the charge and prevents over and under charging of the batteries, thus materially increasing their life; second, it provides the maximum efficiency and eliminates current losses so that the current bill is reduced; third, there is no need for an attendant during the charging, as each battery is cut off as charged and the motor generator set shut off when the last battery is fully charged. It is well at this point to speak about the proper ventilation of the battery box as the temperature of the battery should be kept as low as possible during both charge and discharge.

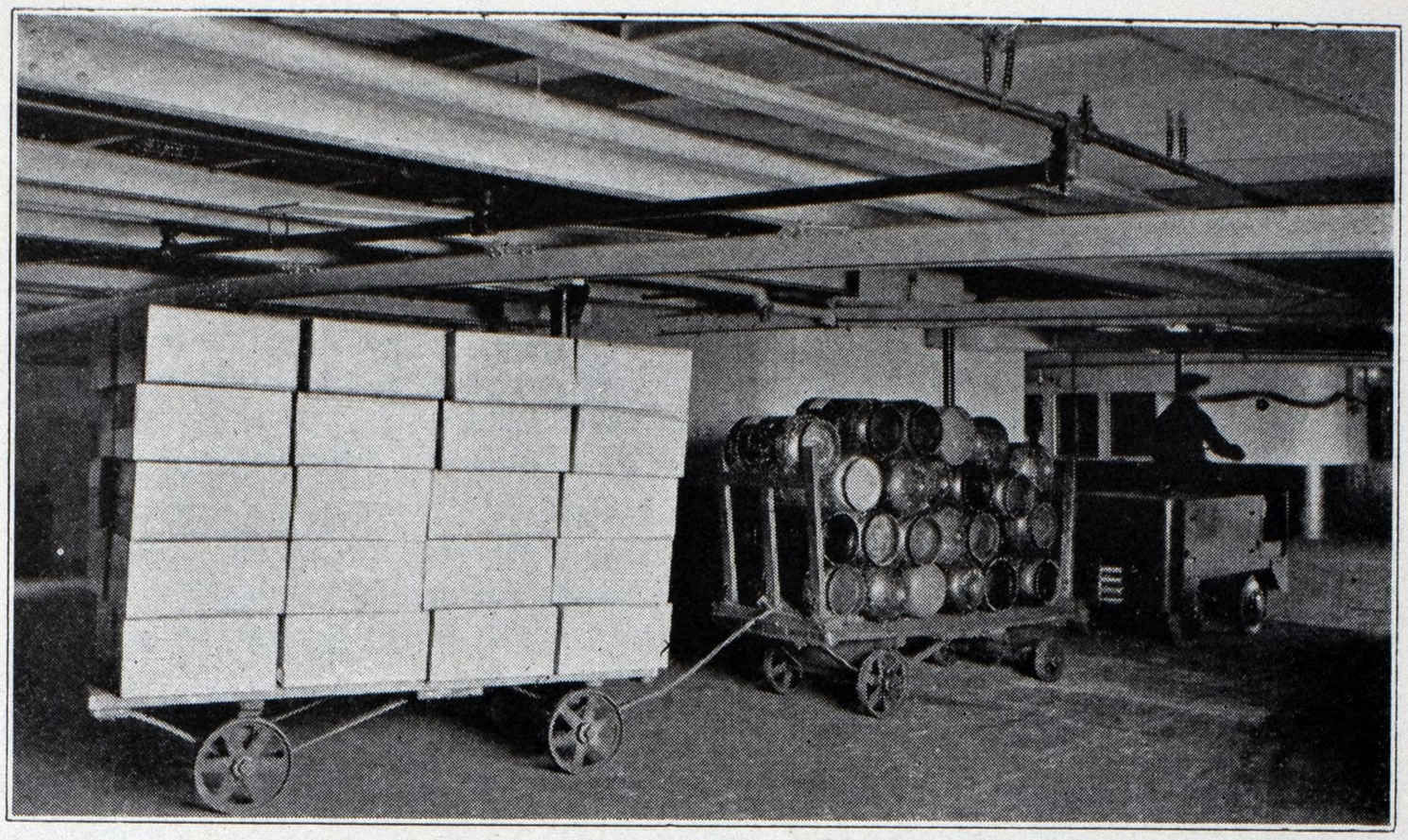
Of equal importance is the maintenance of the electrolyte at the proper level and concentration. It should be remembered that the action of the battery never weakens the solution as only water is passed off in "gassing" or by evaporation. With few exceptions, therefore, it is only necessary to add enough water to bring the solution up to the height specified by the manufacturers and the strength of the solution will be automatically corrected. If the level of the liquid is not maintained the effective area (and the capacity) of the plates is cut down and the exposed part is subject to slow deterioration. The continued use of anything but distilled water will eventually cause trouble as the water is evaporated and the impurities accumulate at the bottom of the cells until they rise to a level where there may be a short circuit.

The above precautions may create the impression that a skilled staff of mechanics should be in constant attendance upon a few electric trucks. In order that this wrong impression may not be created actual instances of maintenance costs might well be given. In a steel mill employing 21 electric tractors which were in service for 20 hours per day the total labor charges for repairs and maintenance amounted to $3859. At $1 per hour for mechanics this amounted to 184 hours per truck per year or 74 hours per truck per year if based on the ordinary 8-hour day—a little less than 1½ hours per week for trucks which averaged 5 to 6 years in service.

Give Low Maintenance Cost

At a marine terminal in the South, the average maintenance and repair cost per truck per year was $234.35. For one month the tonnage handled by these trucks and the savings gained thereby were as follows:

Truck No.	Tonnage handled	Savings
1	5,954	$ 448.00
2	8,240	681.00
3	4,142	392.00
4	3,208	413.00
5	5,520	720.00
6	3,212	380.00
7	3,539	582.00
8	485	43.00
9	2,767	219.00
	36,887	$3878.00



TRACTOR TRAILER OPERATION BETWEEN DECKS ON A LAKE STEAMER

At a Brooklyn pier rolls of paper weighing 1300 pounds each are handled by electric trucks with an ingenious crane attachment which permits tiering the rolls to a height of 9 feet. The rolls are moved an average of 300 feet down the pier and yet each truck stacks 43 rolls per hour. At an operating cost of 50 cents per hour for the truck plus 85 cents per hour for the driver the cost for this handling and stocking operation is less than $0.048 per ton.

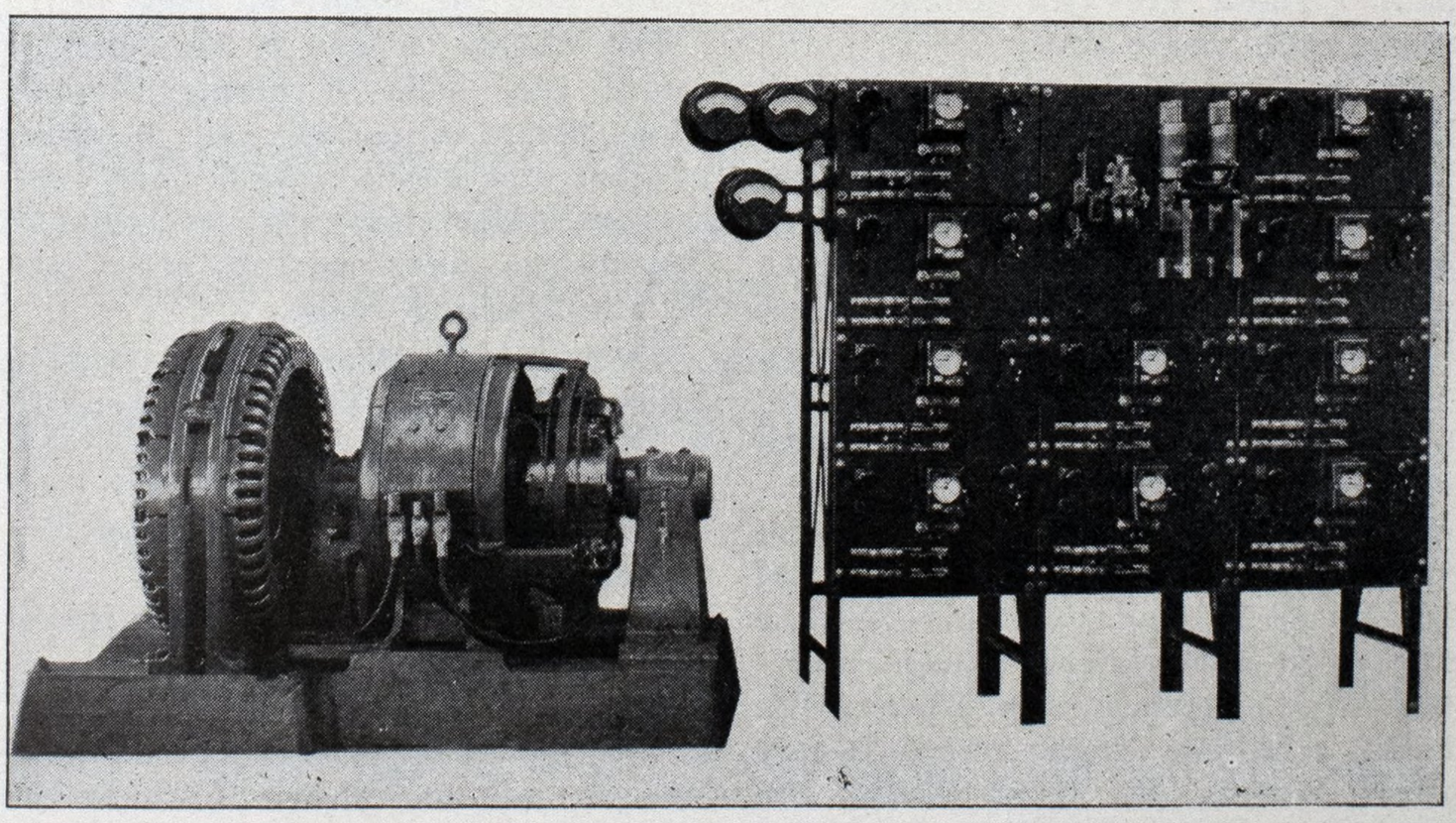
At another location 12 tractors were employed and a monthly report shows the following costs:

Total days of operation	338
Total hours of operation	2,496
Maintenance labor	$303.68
Maintenance material	17.90
Power (4734 k.w.h. at 5c per k.w.h.)	230.95
Total cost of operation	$552.53
Cost per truck per month	42.50
Cost per truck per day	1.63

Keep Accurate Records of Cost

A large concern in the middle west has kept accurate cost records on its industrial truck equipment for the past three years. The cost figures in the accompanying table are for the second year. The company (a subsidiary of the United States Steel Corp.) operates 20 hours per day in most difficult service, the conditions in the plant are not above the average as to floors and ramps but a most excellent repair and maintenance service is supplied and all equipment is regularly inspected. The operating and maintenance expenses are determined per hour of operation, as these costs will increase in proportion to the hours of use, the costs are taken directly from the records of the plant. The fixed charges have been figured on an hourly basis, assuming 20 hour service for 300 days per year. Depreciation, interest in investment, power, battery repairs and maintenance are figured on the 42 sets of batteries for the 21 electric tractors.

It is believed that the figures given in the table provide an excellent example of a well-kept set of records and at the same time are factual evidence that low operating costs are the result of proper maintenance.



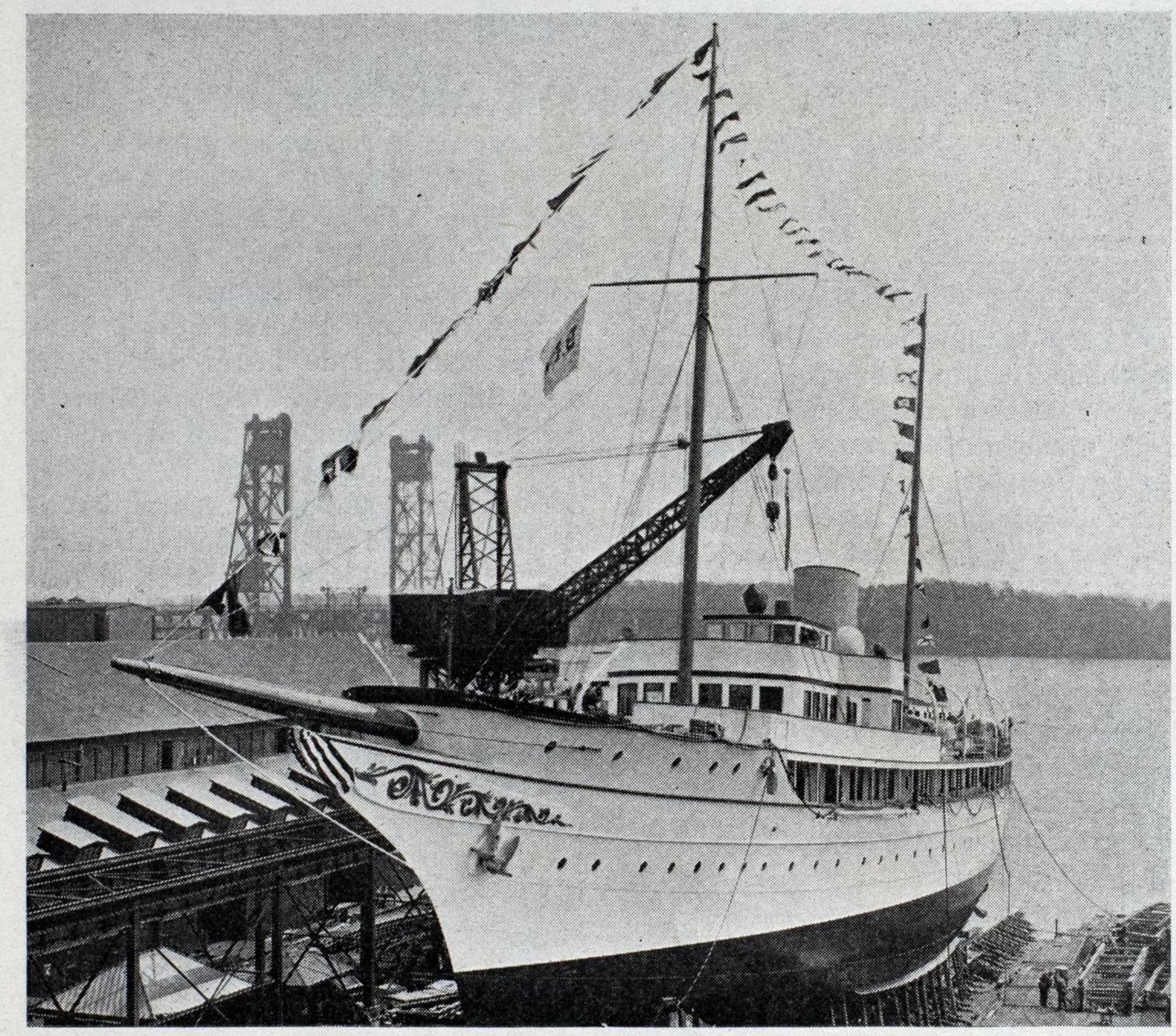
LATEST TYPE OF MULTICIRCUIT AUTOMATIC BATTERY CHARGING SET

Diesel Yacht Launched

(*Continued from Page* 33)

semer type, 4-cycle, solid injection, full diesel, each having 8 cylinders 18 inches in diameter and 22-inch stroke developing 1500 shaft horsepower each and capable of driving the yacht at a speed of 18 miles per hour with the Hyde bronze propellers turning at 300 revolutions per minute.

In the cabin deck aft there are five bedrooms with connecting baths, each of the bedrooms having twin beds. The largest of the bedrooms com-



THE TWIN SCREW DIESEL YACHT HI-ESMARO, DESIGNED BY HENRY J. GIELOW FOR H. E. MANVILLE AND BUILT BY THE BATH IRON WORKS, BATH, ME.

municates with a sitting-room which also has a bathroom attached which is provided with a shower and electric bath. There are two smaller bedrooms with single beds.

At the forward end of the main deck house the galley is located and immediately abaft of the galley is the pantry. Then we enter a large dining room which is furnished in French walnut. This room measures 27 feet by 24 feet, lighted by large windows.

In the pilot house appear the latest navigating instruments, among which is the Sperry Metal Mike. The promenade of the boat deck is a continuation of the topgallant forecastle and is planked in teak. On this deck we find a 30-foot owner's launch, a 27-foot crew's launch, two 28-foot life boats, a 16-foot dinghy and a 26-foot speed launch, all under davits and handled by two electrically operated boat hoists completing boat equipment.

The main propelling engines and auxiliary machinery are already installed in the yacht. The two 100 kilowatt electric generators are driven by a Bessemer diesel, and a 20 kilowatt auxiliary generator by a Cummins diesel. The fuel pumps, bilge ballast and fire pumps, sanitary pumps, sewage pumps, etc. are operated by electric motors. The windlass, warping capstan, boat hoists and hydro-electric steering gear are of Hyde Windlass Co. make and electric motor-driven. The yacht is lighted by electricity, and equipped with a Kolster radio outfit and a radio direction finder.

Telephones are fitted for communication, also the usual call bells.

The heating is done by air which is driven over coils of piping through which steam is passed, and in warm weather the air is passed over coils through which cold water is circulated. The thermo tanks and fans are of the Schutte-Koerting make.

Steam is supplied by a vertical boiler using oil as fuel and fitted with a Ray oil burner. Fresh and salt water for culinary and sanitary purposes is kept at suitable pressure by the Kewanee pressure tanks.

The large cold storage boxes in the holds, and smaller boxes in the mess-rooms, galley, and pantry, are kept at desired temperature by duplicate two-ton ice machines of Brunswick-Kroeschel make.

Gulf West Mediterranean Line Sold by Board

Sale of the Gulf West Mediterranean line to the Tampa Inter-Ocean Steamship Co., New Orleans, the present managing operators, for the sum of $880,000 and with a guarantee that prescribed service will be maintained for a minimum period of five years was approved by the shipping board June 20. The purchasers will take delivery following execution of the sales contract as each vessel terminates its present voyage.

The line is comprised of eight steel cargo steamers of 7825 deadweight tons each, and it is operated between Gulf ports of the United States and Portuguese, Spanish and North African ports west of Bizerta and north of and including Casa Blanca.

With the sale of this service the board's operations have been reduced to those on a total of 17 lines in various overseas foreign trades. The board is, however, considering bids for the purchase of two of this total, and is in process of preparing advertisements for two more.

Shipping Board Sells Fifteen Vessels

Among the recent sales of vessels by the shipping board to private owners are the following:

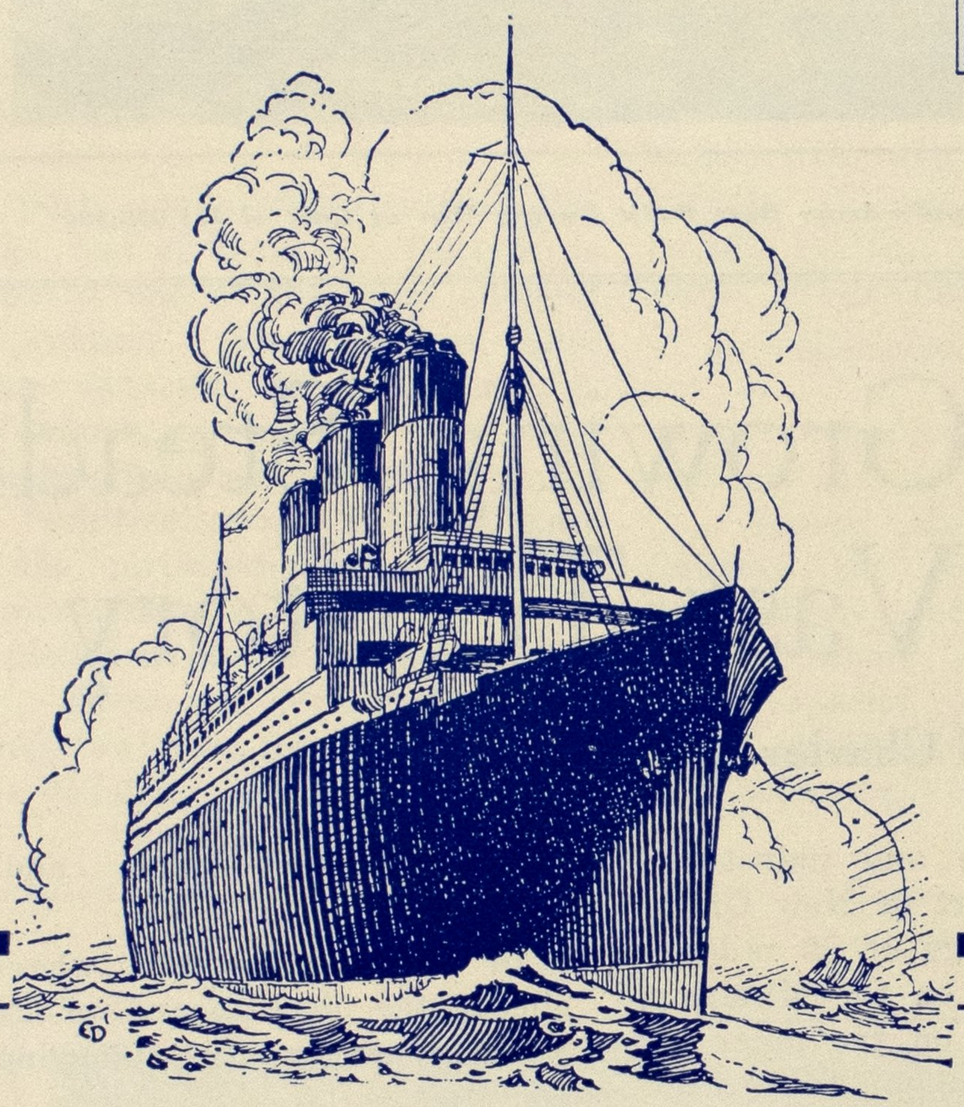
The steamers LAKE FURNAS and LAKE GATUN on May 22 to Merchants & Miners Transportation Co., Baltimore, for $38,000 and $40,000, respectively. The vessels are sisterships of 4336 deadweight tons, equipped with reciprocating engines and water tube boilers with a speed of 9.5 knots.

The steamers ENGLEWOOD, MONMOUTH and MORRISTOWN to Hedley Vernon Thompson and associates of Weehawken, N. J., on May 29, for $106,000, $100,000 and $92,000, respectively. The steamers are of 7323 deadweight tons equipped with reciprocating engines and Scotch coal burning boilers.

Eight lake type vessels on May 29 to the Boston Iron & Metal Co., Baltimore, for $60,000 with the understanding that they be dismantled.

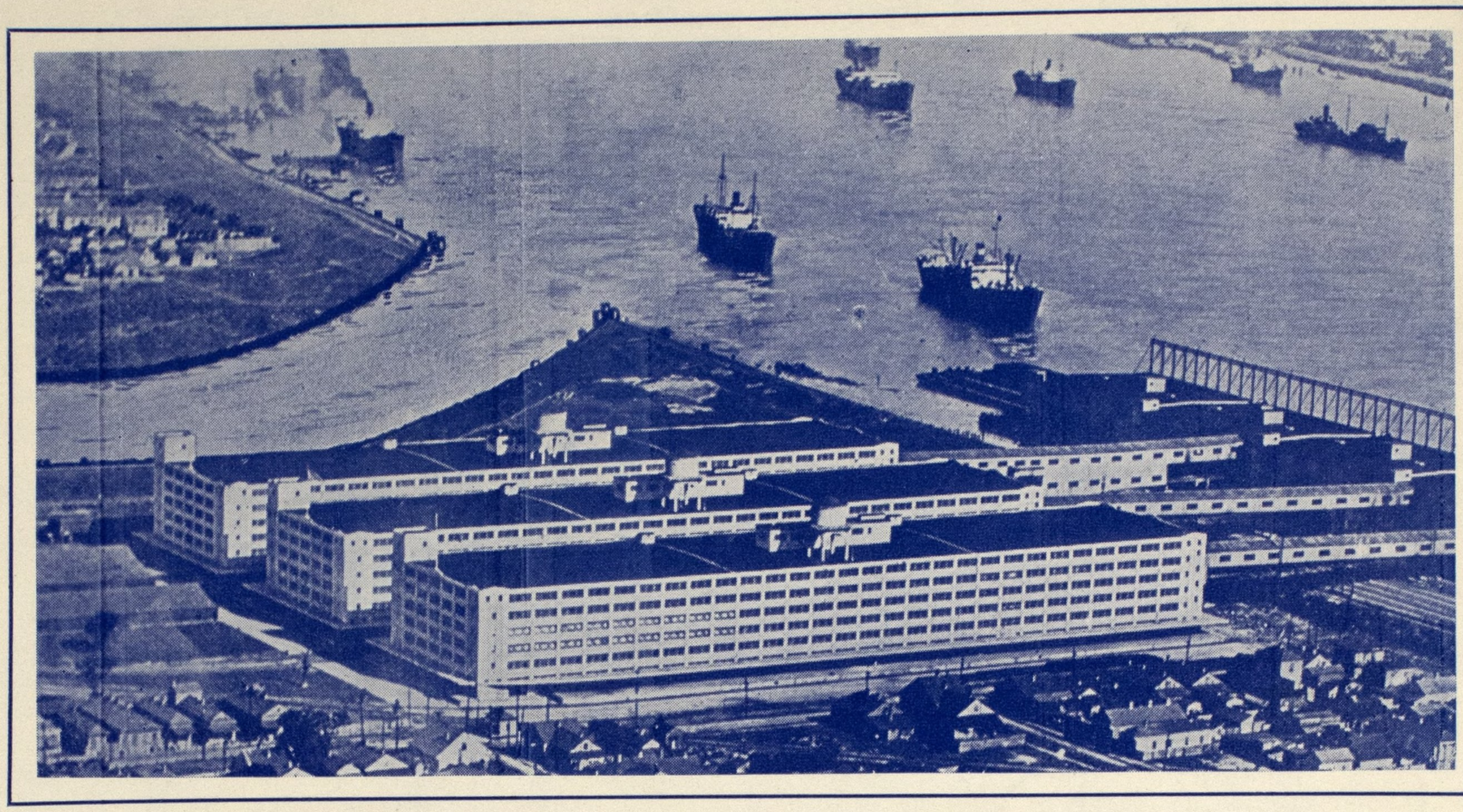
The steamer COPALGROVE to Capt. M. Christopher Stray of Norway for $27,000 cash and the steamer CALICOROCK to Dr. Clarence B. Schultz, an American citizen residing in Germany, for $29,000 cash, on June 5. Privilege of transfer to foreign registry is granted in both cases but it is agreed that for a period of five years the vessels shall not be operated to or from any United States ports.

PROGRESS of GULF PORTS



THE cities of the Gulf have shown an unusually progressive and community minded spirit in the courage and steadfastness with which they have supported port development. The wisdom of such action is fully confirmed in the following pages showing the remarkable growth of water borne traffic through these splendidly equipped ports.

Marine Review
July, 1929



New Orleans—Juncture of Navigation Canal and Mississippi—Army Base Built During War at Cost of $15,000,000

New Orleans Is Growing Steadily as Seaport for Vast Territory

By V. M. Friede and Charles Lammond

WHILE the Mississippi was discovered in 1541, the first colony on the Gulf was founded in 1679 on the Bay of Biloxi. In 1718 Bienville founded New Orleans. This city and the territory of Louisiana was ceded to America in 1803. The original ports along the Gulf coast have rapidly increased in number, forming an almost continuous chain, starting from Key West in Florida and extending to the Mexican border.

New Orleans, which rightly claims to be the second port of the United States, occupies a unique strategical position, being within 107 miles from the Gulf coast on the banks of the Mississippi river. The average width of channel is ¾ of a mile, the depth ranging at low water stage from 30 feet near the banks to 150 and 180 feet. New Orleans from the beginning of its existence was destined to be an important factor in the development of trade and industry of the South. The port of New Orleans has a water frontage of 52 miles, of which 41 miles are on the Mississippi river and 11 miles on the inner harbor navigation canal.

V. M. Friede, co-author of this article is a consulting naval architect of New Orleans. Charles Lammond is connected with the New Orleans Association of Commerce.

Dock Board Rules Port

The port is under the jurisdiction of the board of commissioners of the port of New Orleans, an agency of the state. The dock board administrates with few exceptions all the water front within the port limits which includes 6½ miles of modern steel sheds, which are assigned on preference basis to the shippers, (first call on berths). The average standard widths of wharves is 200 feet. They are equipped with a concrete deck and have a 20 to 30 foot water apron, and a concrete roadway on car floor level 20 to 30 feet broad. The entire length of wharves along the river banks is served by the New Orleans public belt railroad, which is a common carrier and has 90 miles of tracks, owned and operated by the city of New Orleans and co-ordinated industries. Fifteen wharves are equipped with double and single tracks.

In addition to the wharves and sheds, the dock board of New Orleans possesses the following public facilities:

1. Public cotton warehouse with a capacity of 400,000 bales, which is the largest warehouse of its kind in the United States. It is equipped with electrically driven machinery for loading and unloading ships, possesses an escalator and three cotton compressors. Cotton is moved on motor driven trucks and trailers.

2. A public grain elevator which has a mooring berth for ten vessels and a marine leg. Its capacity is equal to all other similar elevators on the Gulf coast. The elevator is built of reinforced concrete, is fireproof, and possesses a sacking plant. Its storage capacity is 2,622,000 bushels.

3. Public coal and bulk handling plant serving the coal and bauxite trade chiefly, equipped to transfer the cargo from ship's hold to river barges directly. Gondola cars are

unloaded in a hopper, while flat bottom cars are unloaded by an overhead traveling grab bucket. The storage pile has a capacity of 25,000 tons.

4. Public vegetable oil handling plant for handling vegetable oil in bulk such as cocoanut oil, palm kernel oil and linseed oil. It possesses four pumps, pumping from ship's tanks directly into tank cars, and it is possible to place 16 cars for loading simultaneously.

5. The port commission leased from the war department and subleases in turn unit No. 1 of the United States army supply base which consists of three reinforced buildings with a wharf 400 feet long (at present being extended), and a railroad storage yard of 743 cars capacity. In the subleased unit are located on the upper floors, the Chase Bag Co., and the International Harvester Co., the lower floor being used as a warehouse.

The port commission operates two fire tugs, one of them the DELUGE, is regarded as one of the most efficient in the country. The combined total pumping capacity of both tugs is 15,400 gallons per minute.

In addition to all the above mentioned facilities owned by the state under the jurisdiction of the board of commissioners, there are numerous other facilities owned by private interests. There are 27 private owned tugs and towboats for general public use (excluding government owned units) having a total of 23,530 horsepower. The floating derricks lifting capacity varies from 15 to 100 tons.

There are a large number of wharves, sheds and storehouses, owned by private interests and operated by various organizations and companies, such as American Sugar Refinery Co., Mangel Mahogany Co., Oversea Railway Inc., Standard Oil Co. of La., United States Industrial Alcohol Co., and others; altogether 36 wharves. The capacity of privately owned cotton warehouses in the port is 238,100 bales, making the total storage capacity in the port 787,500 bales, (public, private and railroad).

New Orleans occupies an advantageous location on the old Indian portage. It is not only the logical point for the interchange of cargoes from river crafts to ocean going ships and vice versa, but the Intercoastal canal crosses the Mississippi within its harbor limits. This canal connects the river with many bayous, canals, lakes of Southwest Louisiana, and through Lake Ponchartrain and Lake Borgne, with the northeastern coast of the Gulf of Mexico. Traffic originating on the upper Mississippi or its tributaries can be delivered on barges or self-propelled boats at Mobile, Birmingham, or any other intermediate point without transfer.

In addition to several private barge corporations and packet services, the government operates the Mississippi Warrior service, Federal Barge line. The line owns within the heart of the city, two floating wharf boats and operates a fleet of electrically driven motor trucks and trailers. All the equipment of the barge line is modern and is built of steel, the lifting capacity of the lower Mississippi barges being 2000 tons each. Towboats, whether sternwheeler or twin screw tunnel boats, are powerful and it is not uncommon for a 15,000-ton tow to be brought to New Orleans. Such a load constitutes the cargo for two ordinary ocean going freighters.

Modernization to the dock board of New Orleans consists in keeping five

Why New Orleans Grows

THE board of dock commissioners of New Orleans has a good slogan. It is—equal treatment for all; special favors for none! A port, a business, and even an individual will go far by holding to such a policy. The life, and get up and go demonstrated by this famous southern city has had quite as much to do with its success and position as second largest port in the United States, as the strategic location nature has bestowed upon it in making it the gateway to the sea of the richest certainly, if not the most fertile valley in the world, the Mississippi river basin.



Port of New Orleans Has 52 Miles of Harbor Front—Mississippi River Commission Yard

years ahead in port facilities and equipment. In other words, declare dock board officials, the wharves and warehouses can take care at present of as much trade or traffic as is anticipated as the maximum possibility half a decade in the future. The board, which is an agency of the state of Louisiana, aims to maintain a constant program of improvement and expansion, rebuilding and repair, newer and better accommodations.

The Public Belt railroad, owned and operated by the city of New Orleans, operates in conjunction with the dock board. It serves without discrimination all public wharves, the public cotton warehouse, the public grain elevator, the bulk commodity and coal handling plant, and the inner harbor navigation canal. Nearly 200 industries and industrial plants are served by the belt system.

The property includes track mileage as follows: main line tracks, 23.25 miles; switch and service tracks, 35.75 miles; yard tracks, 23.20 miles; a total of 82.30 miles in all. Sixteen switching locomotives of modern type are used, and there is a modern engine terminal with 19 stall capacity. The total investment represented is about $4,000,000. Extensions are under way and more are planned.

The General Manager's Report

In his annual report, Col. Marcel Garsaud, general manager of the dock board, said: "Of the 2946 vessels arriving, 2389 aggregating 9,153,311 tons or 83 per cent of the total tonnage arriving in port, used the public docks. An analysis of the 2946 vessels arriving at the port in the year shows that 874 vessels brought in whole cargoes as follows: 157 oil; 47 sisal; 166 green fruit; 129 sugar; 91 molasses; 66 coffee; 30 logs; 19 nitrate of soda; 113 bauxite; 21 phosphate, and 35 of various commodities. Of the remaining 2072 vessels, 786 arrived with general cargo; 361 with ballast; 615 with green fruit and general cargo; 268 with cargo in transit and 42 towing other vessels.

"An analysis of the 2912 vessels in foreign and coastwise trade reported sailing from the port of New Orleans during the year, 132 sailed with whole cargoes as follows: 62 with oil; 17 with steel; 17 with cotton, and 36 with various commodities. Of the remaining 2780 vessels, 1989 sailed with general cargo; 616 in ballast; 120 with cargo in transit; and 55 departed towing other vessels.

"The tonnage of all cargo passing over the board's wharves, exclusive of the grain elevator and the public coal and bulk commodity handling plant, was 4,193,865 tons; of this amount 1,623,754 tons were inward cargo and 2,570,111 tons were outward cargo. In addition to this, 342,484 tons of grain passed through the public grain elevator to ships. The public coal and bulk commodity handling plant handled 91,149 tons of coal; 7575 tons of coke; 330,015 tons of aluminum ore; 5219 tons of zinc ore; 2012 tons of Kentucky rock; 5793 tons of sand and gravel and 5658 tons of pitch fuel. The banana conveyors unloaded 22,946,796 bunches of bananas and 46,557 bunches of plantains. The importation of bananas was the largest on record, exceeding the previous record reached last year by 1,284,030 bunches."

The largest number of river craft in port history arrived during the same period, led by a total of 3066 steamboats.

"The business of the Navigation canal continues to increase. During the year under report, 10,591 vessels, aggregating 4,101,123 gross tons used this facility as compared with 8939 vessels, aggregating 3,609,561 gross tons which used it during the previous year. This represents an increase in the gross tons of vessels using the canal of 13 per cent over the previous year," Col. Garsaud said.

A large portion of New Orleans handled goods find their way, in one form or another, into the stomachs of most of the races of the world. There's coffee and sugar and wheat, to mention three of the most important, and the volume of their annual export or import tonnage per year is remarkable.

More than 80 lines operate from the port of New Orleans. Trade with foreign countries utilizing the port necessitates the maintenance of 35 consulates. During April some 300 ships arrived at the port, an increase of 40 over the same month in 1928. Departures also showed a marked rise over the equivalent period last year.

American Ships Numerous

A gross tonnage of 1,078,269 was represented in the ships arriving, 147 of which were American, 40 each Norwegian and Honduran, and 20 British. The others bore the flags of 13 nations. Increases were shown in ocean shipping, river trade and use of the inner harbor navigation canal, officials of the dock board stated.

Fourteen banana conveyors serve the fruit wharves. An average of two and one-third fruit vessels daily deliver their cargo into the sheds along the fruit wharves. The bananas, other than those intended for local consumption, are loaded direct into cars for cross-country rail shipment. A large part of the Latin-American trade is based upon the yellow fruit, to some extent being the reason for the frequency of sailing to tropic ports. The number of bunches usually runs well over 20,000 and with April as an indication should reach 25,000,000 in 1929.

Brazil ships the major portion of the green coffee which reaches the port. Special provisions are made to handle this commodity, consisting of a two-story concrete and steel wharf of special design and construction. Most of the annual coffee discharge at the port is handled there and amounts to something over 3,000,000 bags annually. The number of vessels discharging coffee there per month ranges from five to eight. New Orleans' splendid import movement from the east coast of South America is attributed to this service.

Port Is Great Trade Center

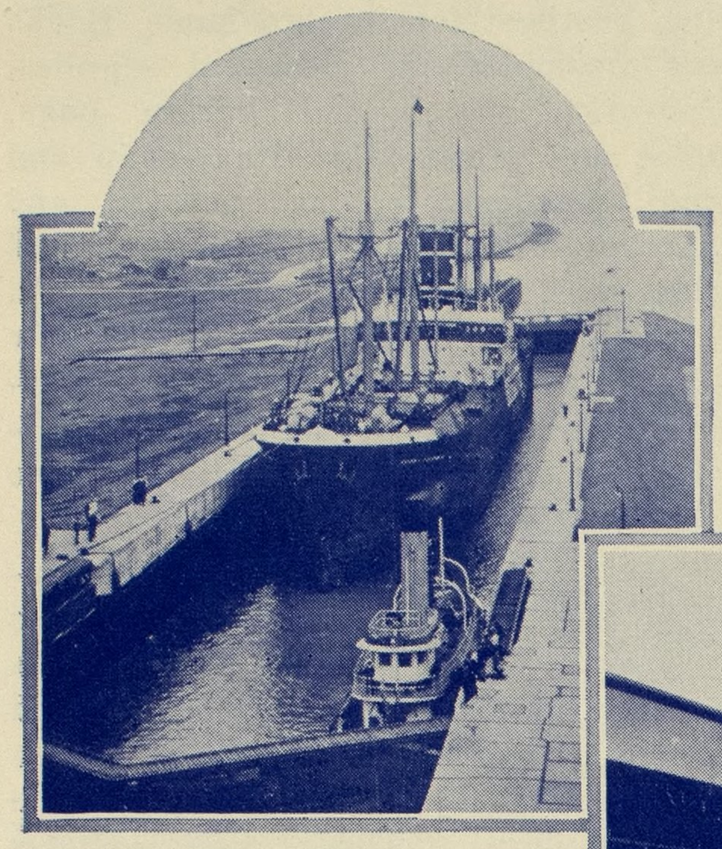
Large cargoes of bauxite and aluminum ore provide the import trade emanating on the north coast of South America. On reaching the port, these shipments are handled by the port commission's bulk commodity plant. The handling plant delivers them either to the federal barge service for shipment to East St. Louis, or to the rail line on the west bank for haul to the same destination.

The port's claim to being the greatest mahogany trade center of the United States and probably the world is borne out through its import of mahogany logs, an important source of commercial relationship with the tropical lands. Great sawmills and handling plants are located on the river. The port commission rents the frontage along which these companies handle their logs.

Other import commodities which play a large part in the volume of the port's trade are nitrates, sisal, sugar, burlap and newsprint. Canada and the Scandinavian countries ship a large part of this last product into New Orleans by sea, and from that city it finds its way by barge or rail to the interior. Much of it is, of course, consumed by local concerns.

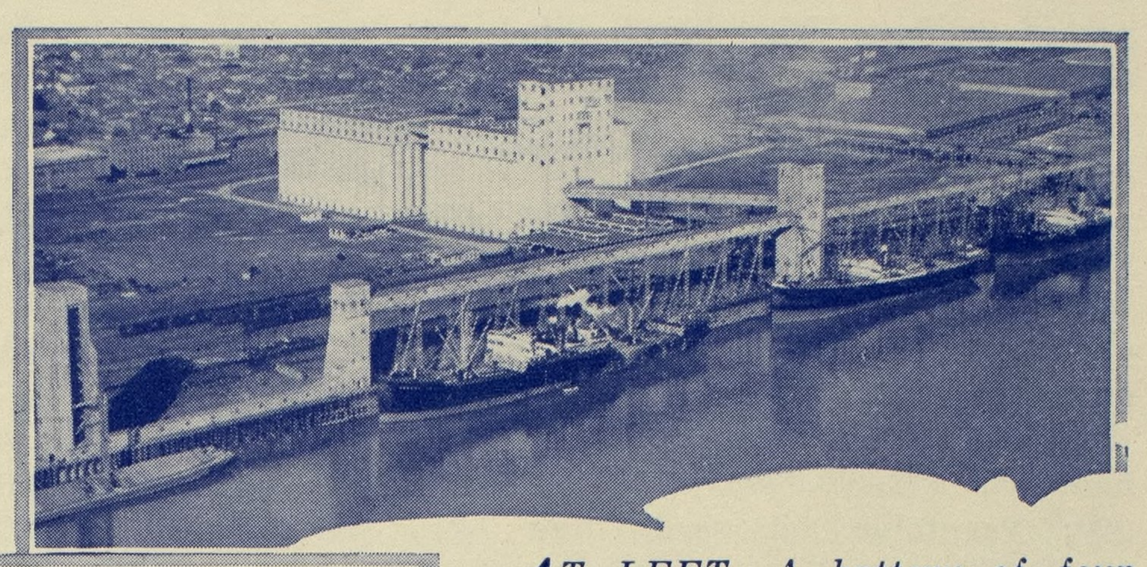
In the last fiscal year the port of New Orleans was first in the import of eleven commodities. Bananas, as previously noted, led. Molasses was second with nearly 100,000,000 gallons imported. Sugar beet seed followed with 8,265,105 pounds. Sisal was next, with 69,206 tons. Mahogany logs to the extent of more than 300,000 feet were imported. There were 2,642,519 barrels of naptha gasoline shipped into the port. Asbestos manufactures amounted to 64,695,917 pounds.

Many Port Activities at New Orleans

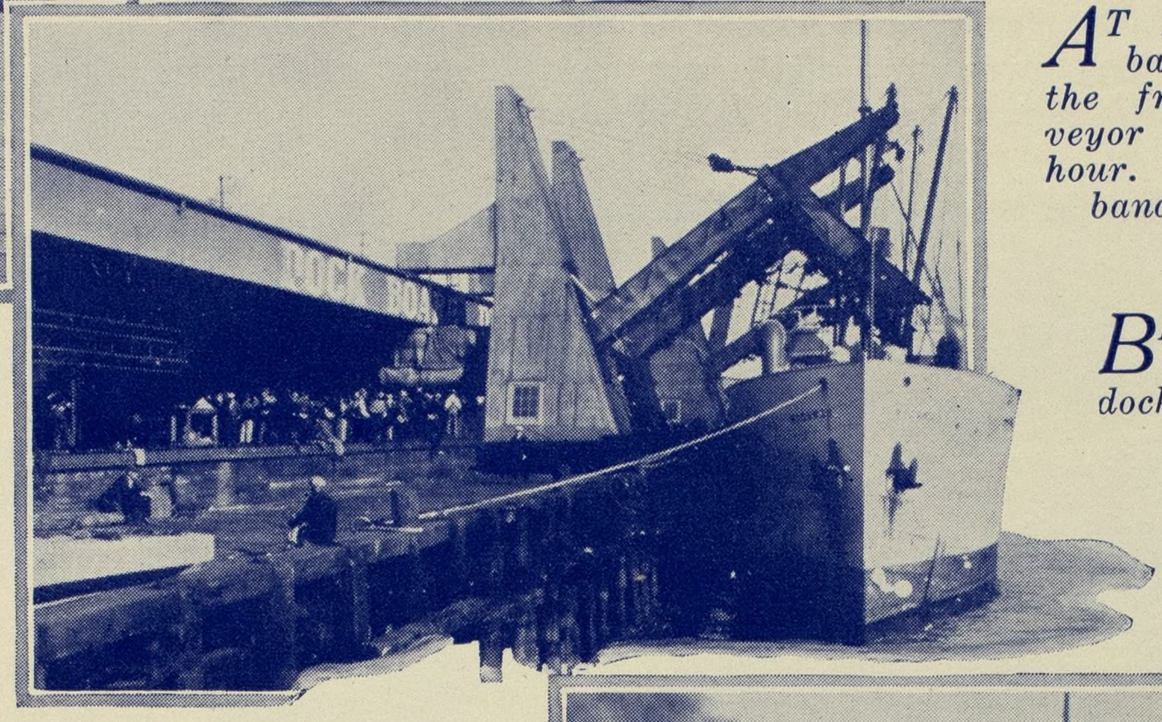


ABOVE — Navigation canal and Goethals lock. Transferring a ship from Navigation canal to Mississippi river, or from river level to sea level, sometimes means a drop of 15 feet

AT RIGHT— This elevator built of reinforced concrete has storage capacity for 2,622,000 bushels. Grain is received and forwarded by cars, barges and seagoing ships

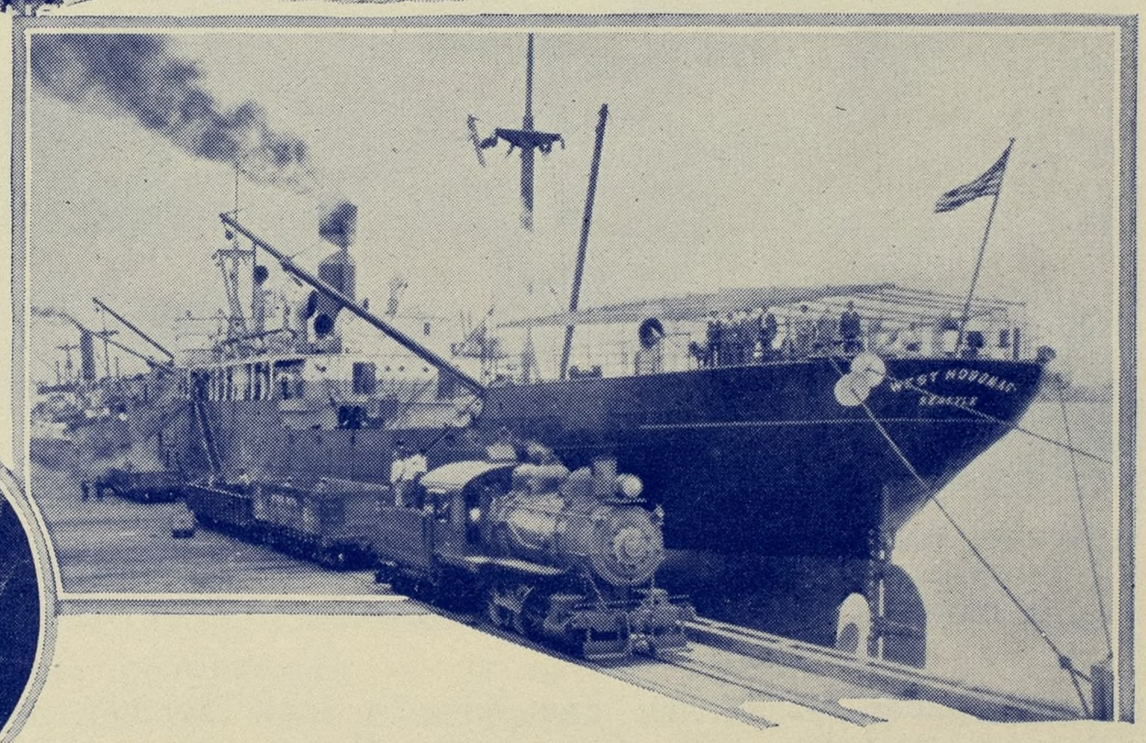


AT LEFT—A battery of four banana unloaders at one of the fruit terminals. Each conveyor handles 2500 bunches per hour. Over 20,000,000 bunches of bananas pass through yearly



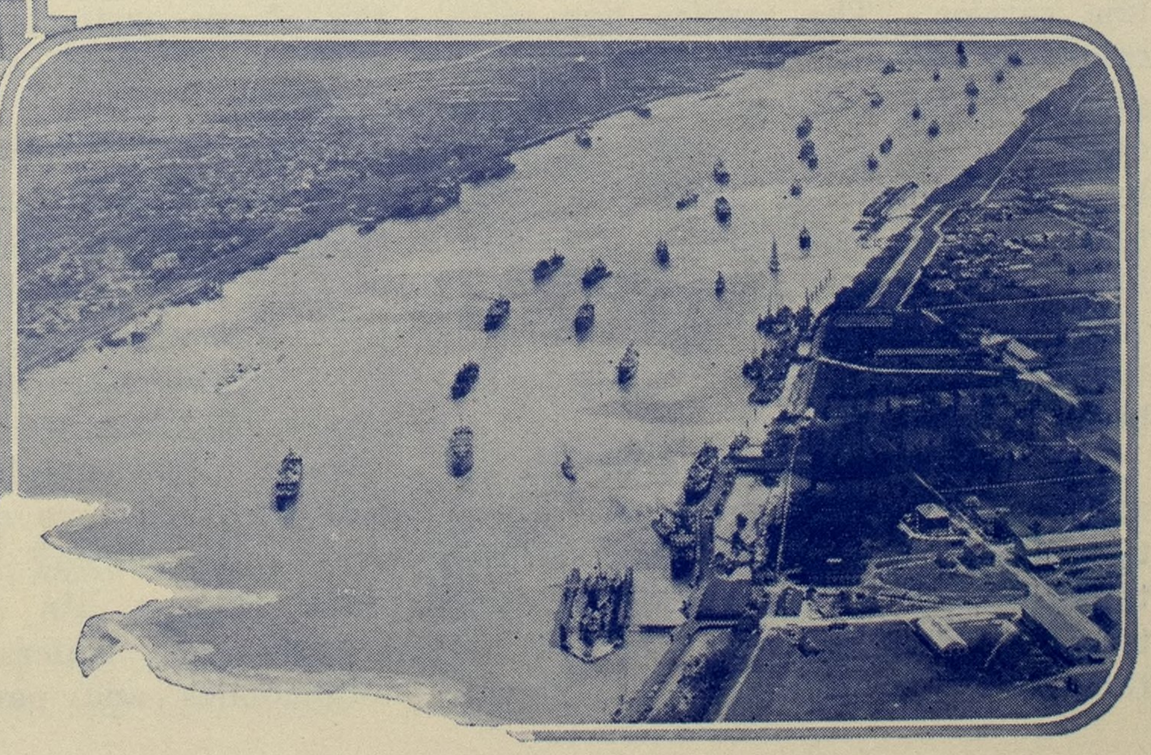
BELOW — Unloading Aluminum ore at Stuyvesant docks—This scene showing ship-side-railroad facilities tells the story of close co-ordination between rail and water carriers which has made New Orleans the nation's second port

BELOW—Public cotton warehouse receiving shed. One of the biggest in the United States, capacity for 400,000 bales, is just one unit of the model equipment of the publicly owned and operated port of New Orleans





BELOW—The anchorage—The 52 miles of deep water frontage of New Orleans harbor makes it rarely necessary for ships to await assignments to berths. This view, however, shows an unusually large number at anchor



ABOVE—Vegetable oil handling plant, showing direct ship to tank car transfer under way on the apron of the New Orleans cotton warehouse. Scene typical of the efficiency of the port

Bauxite tonnage was 277,547. Tankload lots of creosote oil rose to the total of 32,289,068 gallons. A chemical fertilizer, sodium nitrate, totaled 106,559 tons. The somewhat grisly named product, dried blood, filled out the list of firsts with 2300 tons.

Value of Average Year's Imports

An average year's imports are valued as follows by authoritative sources: coffee, $90,000,000; sugar and molasses, $50,000,000; petroleum and petroleum products, $25,000,000, jute and manufactures, $15,000,000; bananas, $12,000,000; sisal, $10,000,000; vegetable oil seeds and oils, $7,000,000; fertilizers, $5,000,000; dead or creosote oil, $5,000,000; lumber or manufactures, $3,000,000; printing paper, $2,000,000; and miscellaneous, including all others, $20,000,000. The grand total is $244,000,000, nearly a quarter of a billion dollars.

Much of the cargo handled at the port of New Orleans comes down by way of the Mississippi-Warrior barge line service. The service has maintained a steadily increasing tonnage gain for some time, as it is evidenced by figures recently released by its officials. In 1928, the grand total in tons handled by the barge line was 1,435,560, about 200,000 more than was handled in 1927, which in turn was 200,000 more than was handled in 1926.

Of the 1928 figures, divisions are as follows: southbound traffic, local, tons, 243,671; interline, tons, 402,305; total, 645,976; northbound traffic, local, tons, 464,860; interline, tons, 324,724; total, 789,584. The ratio of interline and local tonnage is practically on a fifty-fifty basis, due to complete figures of 708,531 tons local and 727,029 tons interline.

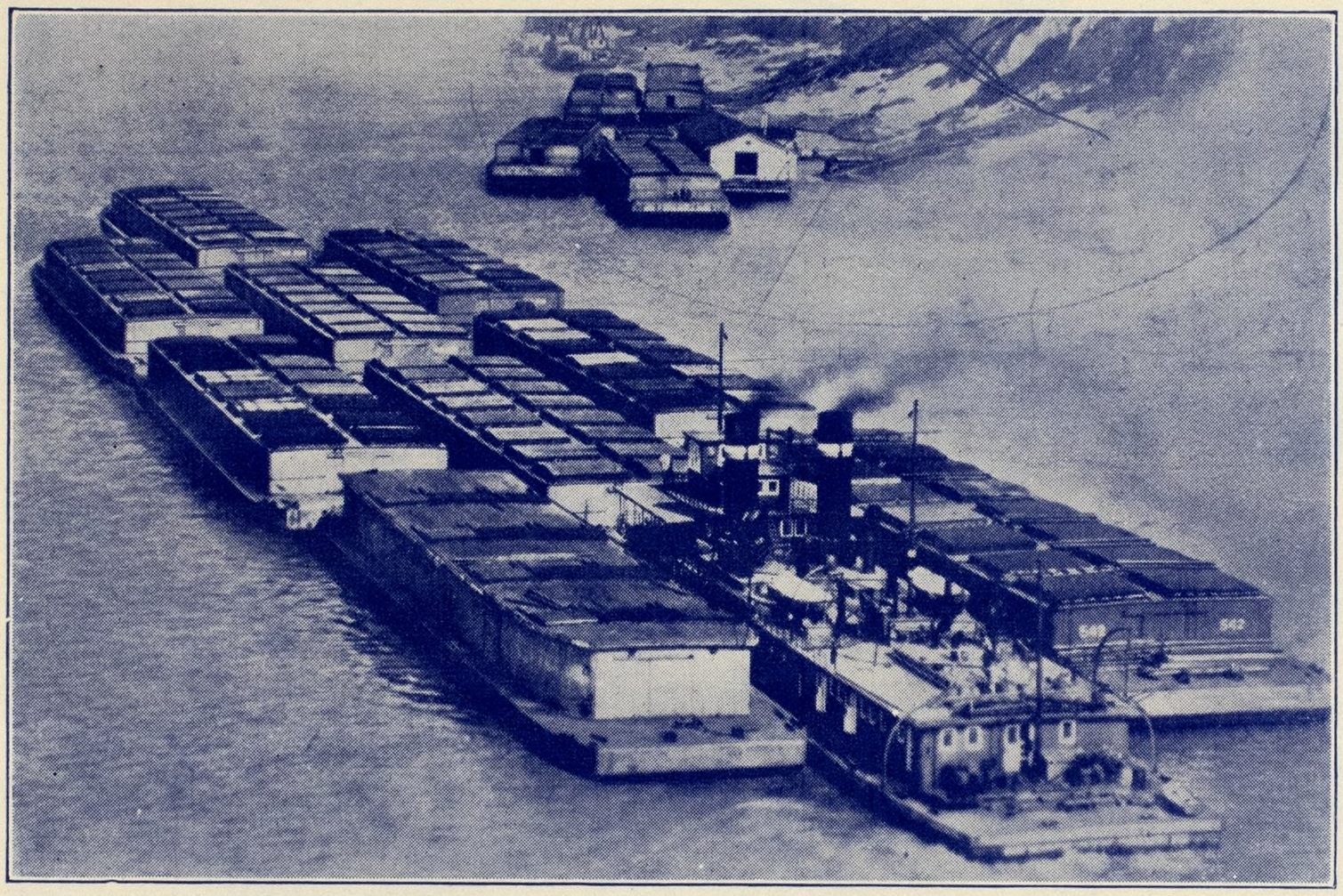
Some 150 products or classifications are included in the tonnage figures of the barge service. Prominent among the larger ocean going movements included in this list were wheat, with a total of 100,102 tons. The wheat was shipped to many countries, for some of which new records were set in shipment orders.

Cotton, reaching the port via the barge service showed more than 75,000 tons for transportation to widely scattered ports. Corn was a little more than 72,000 tons, and barley was high with 55,000 tons. Rye was over 25,000 tons and tobacco was only a little further down the list with 23,106. These were the chief items in products of the farms and plantations.

Among other outbound articles a large amount of metal, in one form or another, was included. And, inclosed in what must have been a large quantity of one particular metal, tin, were various prepared or semi-prepared foodstuffs, namely 31,449 tons of canned goods. As to metals and manufacturers thereof, there was 12,958 tons of ore concentrates; 17,051 tons of wrought iron pipe; 11,026 tons of unwoven wire and nails; almost 25,000 tons of bar sheet and structural steel; well over 14,000 tons of agricultural implements; and several thousand tons distributed among ores, rails, railway tracks and materials, fittings, tin and terne plate, copper, lead, boilers and machinery, automobiles and parts, tractors and accessories, metalware, radiators, roofing material, and miscellaneous manufactures of iron and steel.

About 15,000 tons of edible syrup passed through the hands of the barge line, destined for foreign lands. Books and medicines and electrical supplies, fireworks, paper and burlap bags, paint and prepared roofing, soap and soap powders, baking powder and matches, ink, lime and lye, glass and glassware, and even 6 tons of cork, a sizable cargo despite its very low sum, also showed good totals. General merchandise to the extent of almost 25,000 tons rounded out the cargo coming into the port.

Northbound, the chief item of shipment was bauxite, whose 343,598 tons represents the largest single item tonnage in either north or southbound traffic. Next in northbound and also in complete figures was sugar, with 274,480 tons. These two articles were 23.93 and 19.12 per cent, respectively, of the entire amount of goods handled by the barge line at the port.



FEDERAL BARGE TOW—SOMETIMES CONTAIN 17 BARGES WITH 400 CARS OF MERCHANDISE. LEAVE NEW ORLEANS FOR ST. LOUIS AND UPPER RIVER EVERY 5 DAYS. IN 1928 CARRIED NEARLY 2,000,000 TONS BETWEEN THESE CITIES

Cargo Going Upstream Also

Coffee shipped northward amounted to 26,061 tons. Sisal ran its total to 34,311 tons. Not less than 17,850 tons of bar sheet and structural steel left the port for up-river points. The widely diverse articles, listed as "bagging and bags, burlap, jute and gunny," and "canned goods" both showed totals of nearly 14,000 tons. General shipments of various commodities and varying amounts filled out the tonnage total.

The railroads that enter New Orleans include the Southern Pacific, the Missouri Pacific, the Texas and Pacific, the Illinois Central, the Louisville and Nashville, the Southern railway, the New Orleans Great Northern, the Yazoo and Mississippi Valley, the Gulf Coast lines, the Louisiana Railway and Navigation Co., and others. Between 40,000 and 50,000 miles are represented in the combined trunk mileage of the roads having termini in New Orleans. This is about 25 per cent of the class 1 railroad mileage of the United States.

Many years have gone by since the first settlement on the Gulf coast was established. Out of what was once wilderness and swamps now rise flourishing cities and thriving ports. During the last twenty-five years remarkable growth and expansion has taken place. These ports are destined to play an important role in the business life of the country due to rapidly increasing exports and the steadily growing development of Central and South America.

Mobile — Thriving Seaport of Industrial South



General View of Classification and Storage Tracks, Slips and Warehouses Alabama State Docks, Mobile

Where Rail Meets Ship for Interchange of Cargo

By A. D. Spottswood

MOBILE is prepared to handle every class and type of commerce that enters, or may be expected to enter, the ports of the Gulf, either from the interior of the North American continent or by ocean carriers from other American ports or foreign countries. Mobile's evolution from a cotton and lumber port to one for all classes and commodities, has been so rapid and complete that many shippers in this country and abroad hardly realize the advantages the Alabama seaport has to offer in their particular lines of trade.

Additional steamships and lines in coastwise, intercoastal and foreign trade, new and extended rail connections, including wider application of the joint rail and water rates of the inland waterways and rail lines to interior points, have followed closely the harbor and terminal improvements at Mobile. The forces that brought about these developments are still at work, so that further gains may be expected.

The United States engineers maintain a channel 300 feet wide and 30 feet deep at low tide, through Mobile harbor and bay, and 33 feet wide across Mobile bar. The channel distance from the harbor to the Gulf is 31 miles. The harbor, proper, inside the mouth of Mobile river, is five miles long, about 900 feet wide, and is completely landlocked.

The 30-foot channel continuously maintained from Mobile to the open sea is shown to be ample for the present needs of the port, though surveys have been authorized by congress which indicate that the next project for the port will include the deepening of the channel to a usable depth of 35 feet. Only 5 per cent of the improved harbors have greater depth than 30 feet.

Straight Well Marked Channel

The straight, open and well marked channel enables steamers to proceed at good speed under their own steam to and from the wharves, day or night, and without delay because of the tides; the tidal variation in the lower bay being but 1.1 feet, and in the harbor, 1.4 feet.

Pilotage is under control of the Alabama State Docks commission, the port authority, and is maintained on a highly efficient basis, and at reasonable rates, fixed by state law. The pilotage rates range from $2.50 per foot for vessels drawing 9 feet or under to $6 per foot for those drawing 30 feet or over.

The city of Mobile was one of the first municipalities in this country to obtain control of an important portion of its harbor frontage and to build and operate rail and ocean terminals thereon. The Municipal wharf has a frontage of 1400 feet, near the principal business center of the city. On this wharf there is a steel transit shed, 1360 feet long and 100 feet wide, with concrete floor. Railroad tracks parallel the front and rear.

A portion of the Municipal wharf has been leased to the Mississippi-Warrior barge line of the government-owned Inland Waterways Corp., and is used for storage and transfer of sound and river freights. River steamers, bay boats and ocean carriers utilize the remainder of the berthing space.

Terminals owned by the railroads along the Mobile front include four wharves and piers operated by the Mobile & Ohio railroad, two by the Southern railway and two by these allied lines, jointly. The Louisville & Nashville railroad owns and operates

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The author, A. D. Spottswood, is assistant general manager of the Mobile chamber of commerce. This article was prepared at the editor's request.

a marginal wharf and a coaling plant with a capacity of 400 tons per hour. The Gulf, Mobile & Northern railroad operates two wharves and an extensive log dump near the southern end of the harbor. One of the Mobile & Ohio railroad piers has a grain gallery, connecting with the company's grain elevator. One of the Southern railway piers is occupied by a coal tipple.

Turner terminals, owned and operated by a Mobile corporation, occupy a 38-acre site, conveniently located for shipping, near the mouth of the Mobile river, and consist of three piers, two slips and four warehouses with a total covered space of 150,000 square feet, large open space, used chiefly for handling lumber and timber, and modern trackage arrangements for shipside delivery by rail carriers.

The Texas Co. has a wharf and an extensive fuel oil station near Choctaw point, at the southern end of the harbor.

The upper or northern portion of the inner harbor on the west side of the river is occupied by the terminal facilities constructed by the state.

The east bank of Mobile river is largely occupied by ship building and repair plants, a storage warehouse used by the United States engineers and the coal and ore handling plant of the Inland Waterways Corp. There are no rail connections on the eastern side of the harbor.

Practically all of the terminal facilities enumerated above were in operation in the year 1923, when the state of Alabama, by a vote of its citizens, decided to expend not more than ten million dollars for a complete and modern system of rail and water terminals at the port of Mobile. This work was done by the Alabama State Docks commission, of which General William L. Sibert, United States army retired, is the chairman, chief engineer, and general manager, with Frank G. Blair, of Tuscaloosa, and former governor Charles Henderson, of Troy, Ala., as the other members of the commission. The completed terminal system was officially opened June 25, 1928, though some of its units had been in operation before that time. The plant has been declared by eminent authorities to be the most modern and efficient of its kind in the world.

Docks of Latest Construction

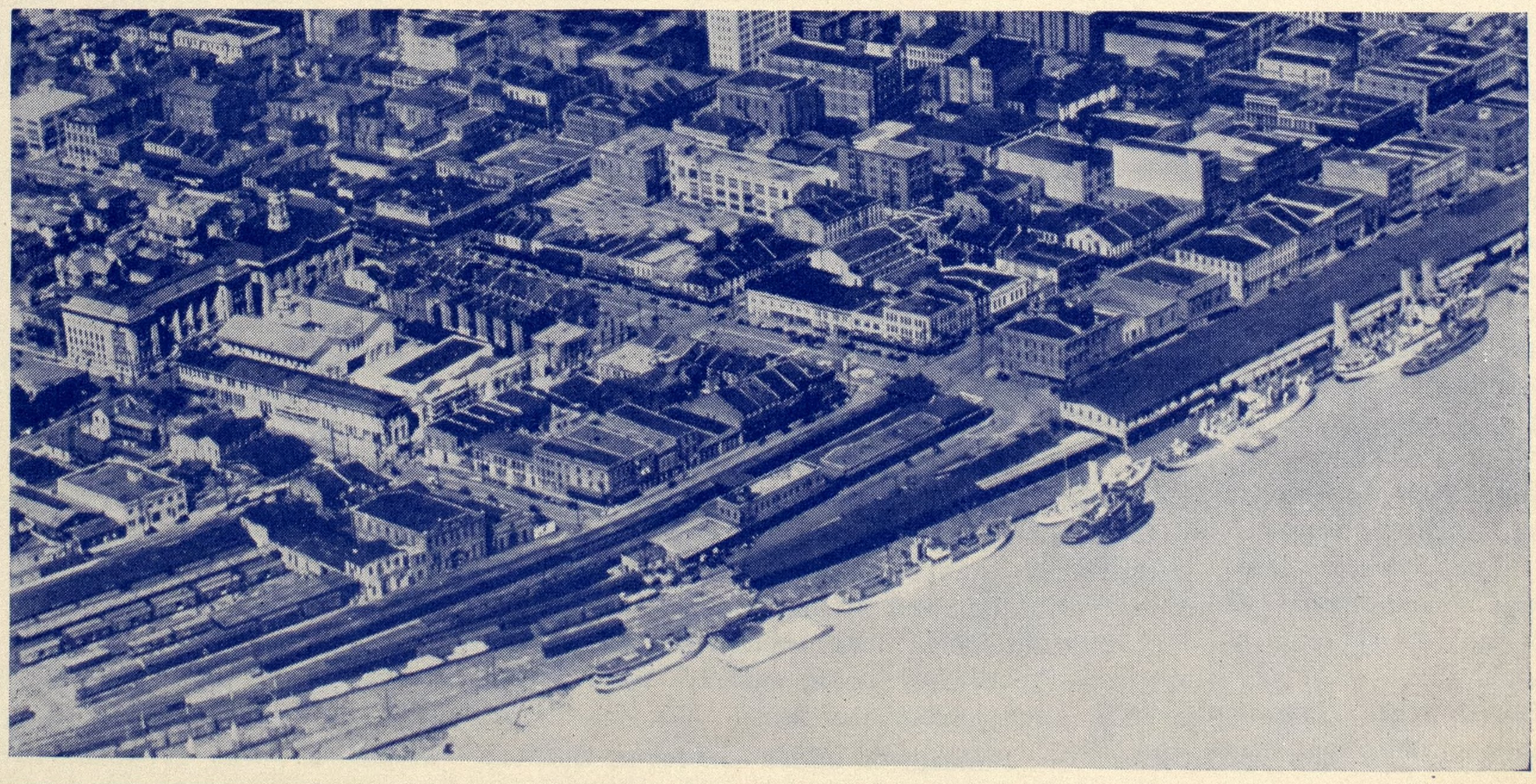
Each of the three steel, concrete piers of the Alabama state docks is 1600 feet long and Pier B, the typical pier of the system is 560 feet wide. The slips between are the same length as the piers, 350 feet wide, and 32 feet deep. The apron wharves carry three marginal tracks with crossovers at frequent intervals, for convenience in moving cars to and from shipside, without disturbing other cars that may be loading or discharging freight.

One section of Pier A is occupied by a high density cotton compress having capacity to compress 110 bales per hour to the density desired. The five compartments of the cotton warehouse section have a storage capacity of 25,000 bales, and the adjoining and connected warehouses and transit sheds give a total storage capacity of more than 150,000 bales within stevedoring distance from shipside. These compartments are all constructed of steel and concrete, equipped with approved sprinkler protection, and carry a fire insurance rate of 22½ cents per $100, per annum.

Pier B has two steel-concrete warehouses, sprinkler protected, with rail and truck delivery between and surrounded on three sides by apron wharves. The total storage space of these warehouses is in excess of 14 acres, making this one of the largest covered piers at shipside in this country. This space is divided into numerous compartments, separated with fire walls and steel doors.

Pier C, used for open storage, gives almost unlimited space for lumber ramps and accumulation of freight of various kinds that do not require protection from the weather. It is equipped with a 75-ton derrick, electrically operated, and the railroad tracks are so located that a railroad crane may unload heavy articles from cars pending arrival of ship.

The bulk material handling plant is located beside a deep, wide slip at the mouth of Three Mile creek, at the northeast corner of the 550-acre docks site, so that two steamers can load or discharge cargo at the same time. The plant was designed for handling coal, coke, bauxite, manganese and iron ore, phosphate rock, sulphur and



An Air View of Mobile Showing Operation of Waterfront—Ships Unloading Bananas

other bulk materials. Its capacity for handling coal from car to ship is 600 tons per hour and from storage to ship with about the same dispatch. Material may also be moved from vessel to storage, storage to car or vessel to vessel and vessel to car. The plant is connected with the joint interchange tracks, which give equal access to and from all rail lines entering the port.

compared with those in effect at other Gulf ports.

The total of covered warehouse space at shipside, including the state docks, is 2,098,394 square feet, all of which has convenient rail connections. In addition to this, the Warrant Warehouse Co. has 500,000 feet of covered warehouse space, not at shipside, but adjacent to railroad wharves, state docks, and Municipal wharf.

ment through the port: On March 7 3360 tons of cargo coal (68 carloads) were ordered from Birmingham. On March 8 the cars were loaded at the mines and began moving to the port on the ninth. The coal arrived at Mobile on the tenth and was placed at the state docks tipple by the Terminal railway. On the eleventh the entire cargo was loaded in the ship in seven hours and the vessel sailed



MOBILE. UPPER LEFT—ALABAMA STATE DOCKS CONSTRUCTED AT COST OF $10,000,000. UPPER RIGHT—SHIPS AT TURNER TERMINAL LOADING TIMBER. LOWER LEFT—SOUTHERN END OF HARBOR. TODD SHIP REPAIR PLANT, TURNER TERMINAL; TEXAS CO. TANK FARM. LOG RAMP AND PIER OF G. M. & N. RAILROAD. LOWER RIGHT— PLANT OF ALABAMA DRY DOCK & SHIPBUILDING CO.

The Alabama state docks own and operate their own terminal railroad, with 36 miles of main line and switching tracks, classification yards and joint interchange tracks, connecting all units of the system with all rail carriers.

All of the wharves and piers, publically and privately owned, where ocean going vessels are berthed, are connected with the municipal waterworks, where an abundance of chemically pure water may be obtained by ships at rates relatively cheap as

Mobile, with the Birmingham coal district only 257 miles inland, enjoys more favorable freight rates on coal than any other port on the Gulf, with the single exception of Pensacola, Fla., and is on a parity with that port on rail rates, but has an advantage on the water rates by river.

Equipped with ample facilities for handling bunkers and cargoes of coal, the port is rapidly gaining prestige as a coaling station. The dispatch and efficiency with which coal is handled is best illustrated by a recent move-

in less than ninety-six hours after the coal was ordered.

Extensive and efficient shipbuilding and repair plants at Mobile have been important factors in bringing about the large increase in the port's tonnage and commerce, for Mobile shipyards attract vessels requiring repairs and overhauling from points on the Atlantic seaboard as far north as Chesepeake bay; from all parts of the Gulf and from Central and South American ports.

The Alabama Dry Dock and Ship-

building Co. and the Todd Shipbuilding and Dry Dock Co. Inc., have the most extensive plants at the Alabama seaport. Their largest dry docks are of 10,000 tons capacity and their shops and equipment are such that major repair and construction contracts can be completed with the greatest dispatch. The Southern Dry Dock and Shipbuilding Co., Harrison Shipbuilding Co. and Murnan Shipbuilding Corp. have smaller but efficient plants for building small craft and making marine repairs.

Immediately after the World war a subsidiary company of the United States Steel Corp. built eleven first class freight steamers of approximately 10,000 tons at Chickasaw, Mobile suburb, and President James J. Farrell, of the steel corporation, has publically stated that when more ships are required, they will be built at the Chickasaw plant; that nowhere in this country could the steel corporation build such ships with greater economy. The plant at Chickasaw



CARGO HANDLING AT PIER B, ALABAMA STATE DOCKS. SHOWING HOW SUGAR IS HANDLED FROM SHIP TO WAREHOUSE

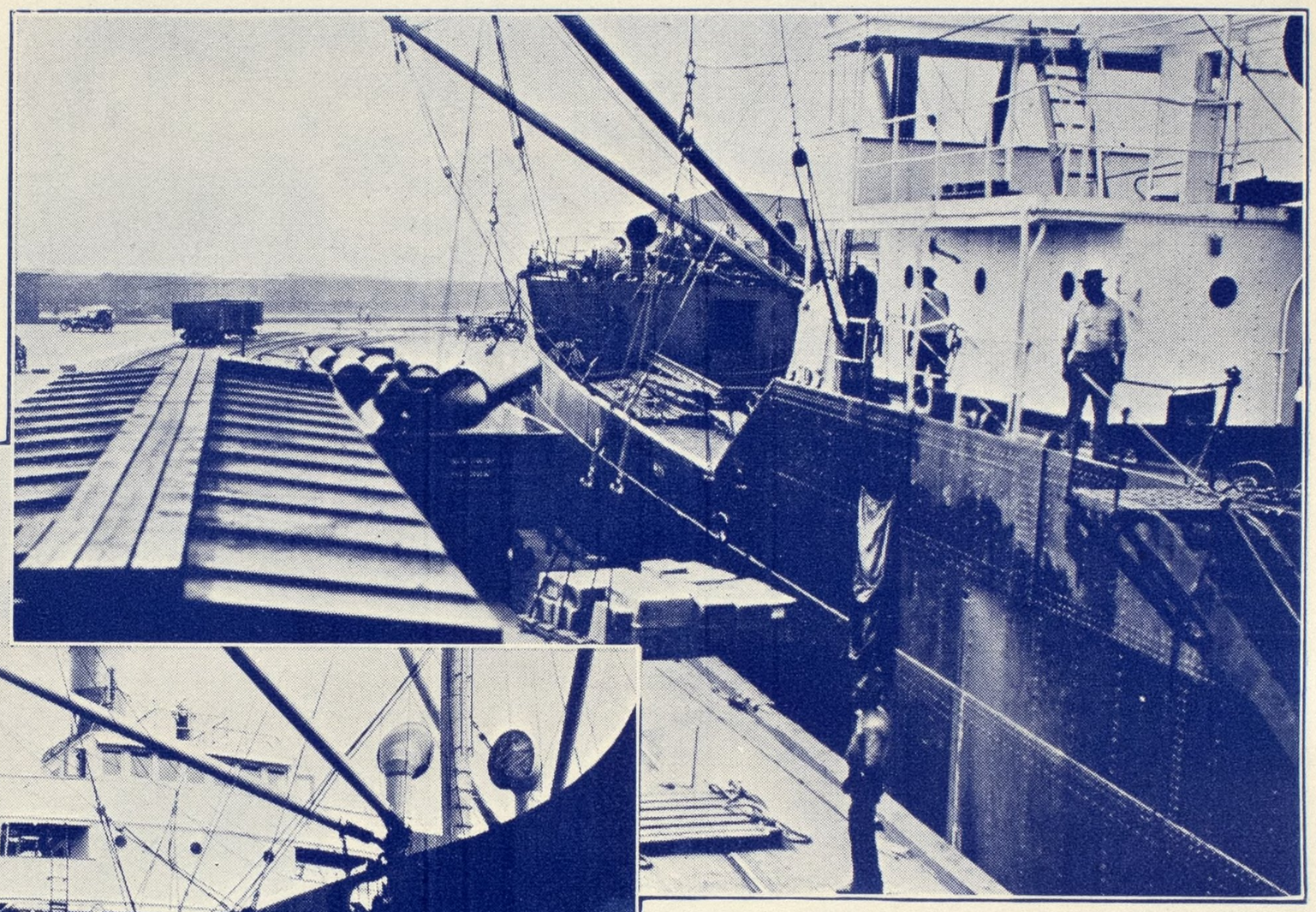
and the modern industrial city built to house employes, could again be placed in commission with minor replacements. The big corporation has refused to sell any part of its Chickasaw holdings.

Improvement of channel and harbor, construction of modern terminals, with the wide advertisement received as a result of this forward movement by the state of Alabama, together with some favorable revision of the rate structure and additions to rail and steamer lines serving the port of Mobile, have combined to greatly increase its commerce, as shown by statistics recently released by the United States engineers. The report shows the total commerce for the year 1928 including bunker coal and oil was 4,405,872 tons, valued at $153,268,228. This is the largest total, both in tons and value, in the 200 years of Mobile's port history. It represents an increase of 227,104 tons and $9,795,485 over the 1927 commerce, and an increase of 212 per cent over the commerce of 1921, the first normal post-war year. Imports showed the largest increase, and shipments coastwise next. The imports consisted largely of bananas, cocoanuts, molasses, sugar, dying materials, news print paper, manganese ore, iron ore, kainite, manure salts, sodium nitrate, asphalt, crude drugs, and other miscellaneous items. Exports consisted principally of grain, naval stores, unmanufactured cotton, logs, lumber and timber, coal, coke, manufactured iron or steel, railway track material, pipe, wire, machinery, ammonium sulphate, and a variety of other commodities. By far the most important item in the export list was raw cotton. The value of this item exceeded all others, amounting to $22,353,448.

The coastwise shipments, which include intercoastal trade via the Panama canal, show a substantial increase. The biggest item in this trade is iron pipe and fittings and other forms of manufactured iron and steel from the Birmingham district.

Regular and frequent sailings of numerous steamship lines from port of Mobile to those ports and countries with which the ports of the Gulf have advantageous trade relations should be given a great part of the credit for the Alabama port's expanding commerce.

There is an average sailing of one ship every three days from Mobile to



LOADING CAST IRON PIPE AND UNLOADING CANNED GOODS FROM PACIFIC COAST AT MOBILE

the Pacific ports of the United States. John W. White, assistant to the general manager of the state docks estimates that the west coast traffic to and from Mobile, has increased 16 per cent during the twelve months ending June 1, this year. The four lines in this trade are the Gulf Pacific, Luckenbach, Redwood and Isthmain steamship operating companies.

Frequent sailings of the Aluminum line, Munson line, Mississippi Shipping Co. and Van Heynigan Brokerage Co. have greatly increased the regular commerce of the port with Central America and South America. A list of sailings published monthly by the state docks commission shows 32 lines making regular sailings to various parts of the world.

While providing a site for the Alabama State terminal system, the docks commission acquired a tract of 550 acres of land fronting on Mobile bay and within the city limits of Mobile, both for future expansion of the port terminals and for lease to tonnage producing industries.

Houston—an Inland Ocean Port

A Railroad Center Brought to Ship's Side—Every Convenience, Safety and Wharf Facility Furnished Shipping — A Progressive Sea Port

By Burt Rule

A RAILROAD center brought to ship's side through the enterprise of its citizens and the aid of the Federal government may fairly, if rather roughly, describe Houston, Texas. Port of Houston is located in latitude 29 degrees and 45 minutes north and longitude 95 degrees and 17 minutes west. The entrance to the port is through a tidal channel extending from the Gulf of Mexico through the jetties between Galveston island and Bolivar peninsula across Galveston bay, a distance of 25 miles, thence up the San Jacinto river through low lying marshes and shallow bays to Lynchburg, a distance of nine miles, then up the historic Buffalo bayou at Houston, a further distance of 16 miles, making a total distance of 50 miles from the harbor to the Gulf. From Galveston bay to the Turning basin the natural channel has been deepened, widened and straightened and the banks from 8 to 30 feet high offer splendid locations for industrial development with rail and water connection.

The ship channel now has a uniform depth of thirty feet throughout its length, barring slight shoals that occur from time to time, which are promptly removed by government dredges. The width is 250 to 300 feet on the bottom from Bolivar roads to Morgans point, and 150 to 180 feet on the bottom from Morgans point to the Turning basin, all with side slopes of one foot vertical to three feet horizontal. The turning basin has a diameter of 1100 feet, and depth of 30 feet.

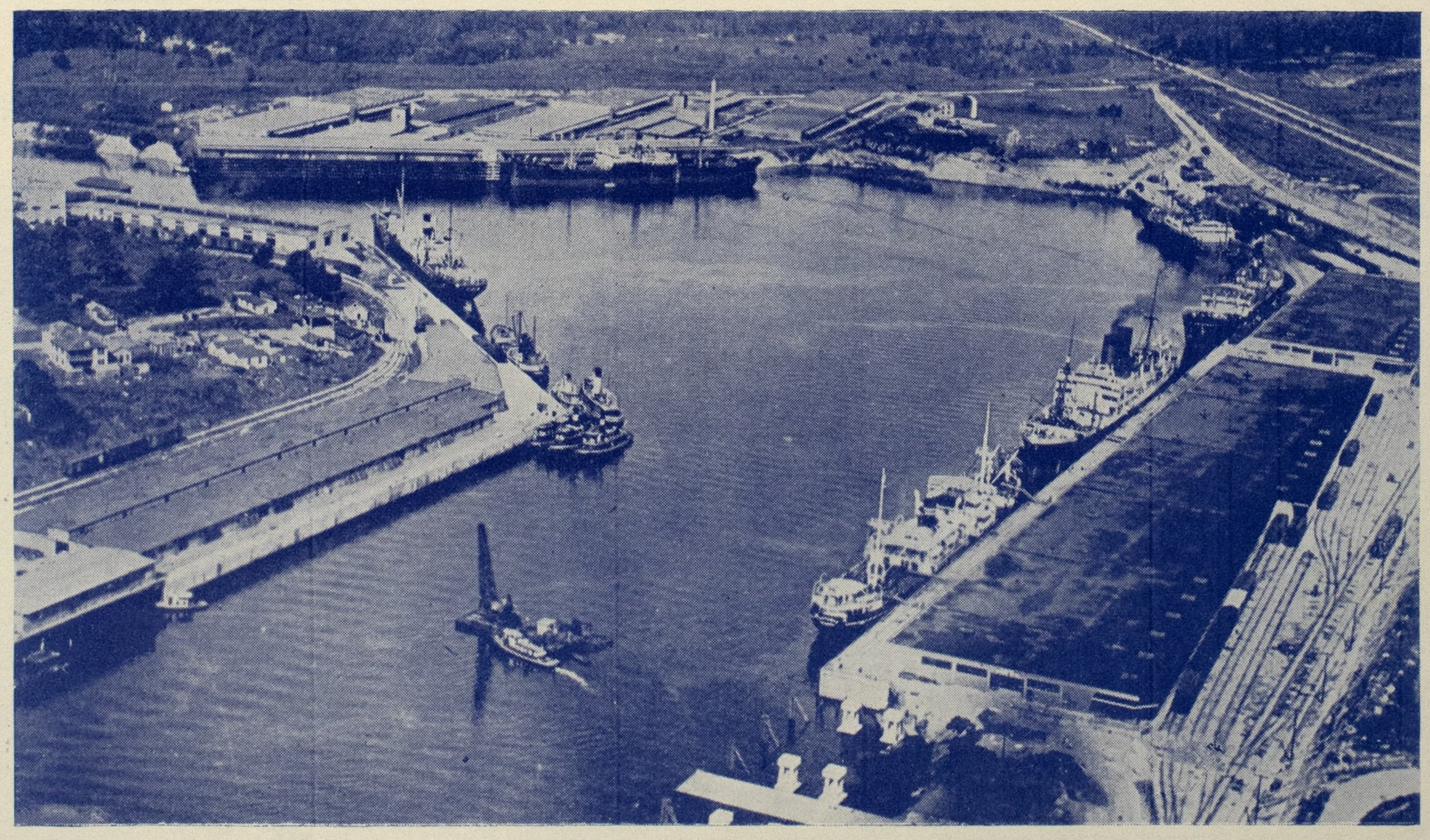
Ample Room for Expansion

Terminal facilities, both public and private, have been located at various points along the channel between the turning basin and Morgans point, a distance of 25 miles, and the entire section is susceptible of development in a large degree for both shipping and industrial purposes. The soil along the channel is composed of sand and clay, there being no rock to make construction work expensive. The port of Houston being situated within a few miles of the Gulf of Mexico in a natural valley with a gradual slope to the north and west and at a point where the great transcontinental railroad lines reach east and west across Texas and out to the Pacific coast, and with other trunk lines extending northward, westward and southwestward in a fan shape to the great agricultural, live stock, mineral and oil producing centers of the great southwest, is most admirably located from a geographical point of view for a great industrial center and assembling point for both raw material and manufactured articles.

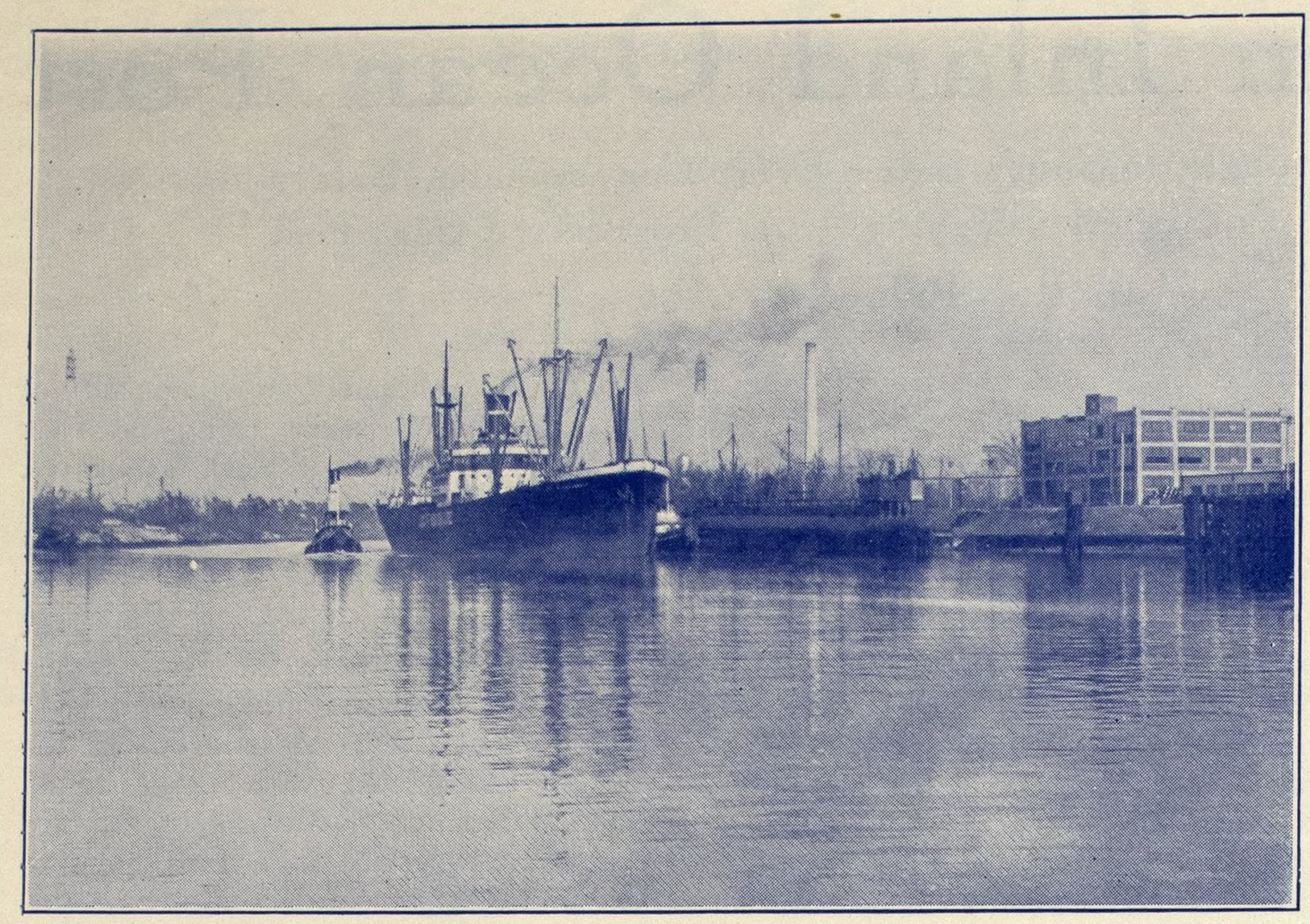
The climate is salubrious, the temperature seldom rising above 90 degrees or below thirty degrees—hence work of all kinds can be carried on through the entire year.

The use of the Houston ship channel as a waterway dates back to the early settlement of Texas, said boats

The author, Burt Rule, is publicity director of the chamber of commerce, Houston. This article was especially prepared at the request of the editor.



Turning Basin—Houston's Ship Channel—Old River Bed Deepened and Widened to Make Seaport



EXTENSIVE INDUSTRIAL DEVELOPMENT ON THE BANKS OF HOUSTON'S SHIP CHANNEL

working their way up the meandering tidewater stream of Buffalo bayou as early as 1825; this was later followed in the sixties and seventies by steam boat traffic; a line having been established at one time by Commodore Charles Morgan between Houston and New York using shallow draft side wheel steamers. However, this type of vessel was soon obsolete and as the condition of the stream would not permit the entry of deep draft ships, the traffic was limited to tugs and barges. Houston being a great concentration point for cotton kept a large fleet of barges busy conveying the cotton from the compresses and warehouses to shipside in Bolivar roads at Galveston.

By the river and harbor act passed by congress March 3, 1899, a project for the construction of the Houston ship channel to the depth of 25 feet was adopted and construction commenced a few years later. However, progress was rather slow and it was not until 1910 when the local interests proposed to share with the government half of the cost of the construction and completion of the 25-foot channel that serious and determined efforts were made to complete it promptly. Congress then appropriated $1,250,000 and the navigation district comprising Harris county issued bonds to the same amount and contracts were let for the entire project. This 25-foot channel was completed to full depth and width on Sept. 7, 1914.

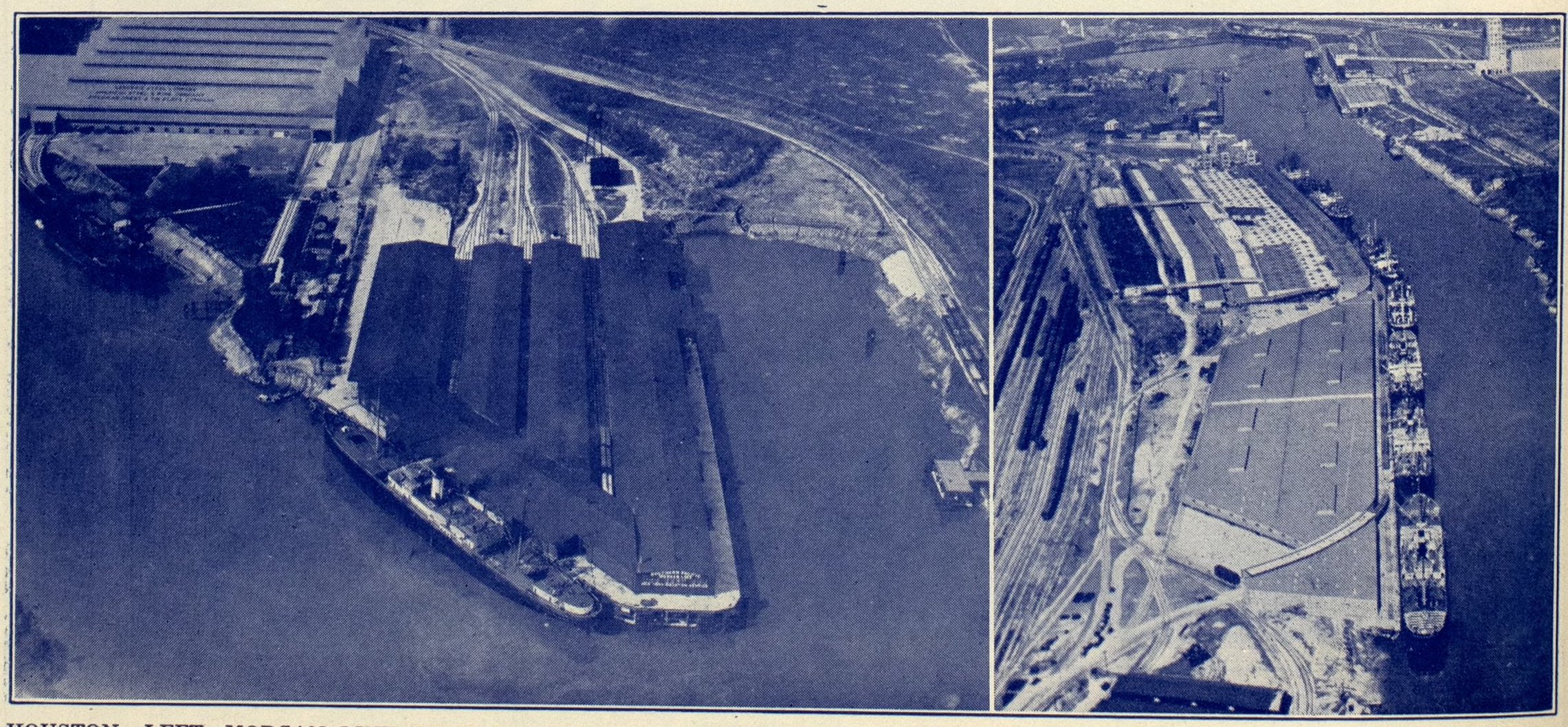
On account of growing traffic in 1919 this channel proved inadequate and congress approved the project on March 2 of that year for deepening the entire channel to 30 feet and widening it to 250 feet across the bay and 150 feet from Morgans point to the turning basin. Local interests were asked to contribute the sum of $1,365,000 toward the cost of the work, which was estimated at about $4,000,000. The 30-foot channel was completed in September, 1925.

Still Deeper and Wider Channel

The river and harbor act of March 4, 1927, provided for "Preliminary examination of the Houston ship channel with a view of securing increased depth and width." In accordance with the above authorization the examination and survey has been made, public hearings held and a report made by the United States district engineer to the chief of engineers, who will submit same, with his recommendation, to the secretary of war and thence to congress. As a result of this survey it is expected that congress will authorize a still further substantial improvement of the waterway.

By an act of the state legislature approved by the governor on March 26, 1927, the state of Texas ceded to the Harris county Houston ship channel navigation district all the state-owned islands and submerged lands under the shallow lakes and bays lying between Morgans point and San Jacinto battle ground, together with all rights of the state in the main channel and tributary streams, all for the purpose of development of commerce, the state reserving all mineral and oil rights.

This act makes available a total area of about 11,000 acres of land and water suitable for development into a vast public terminal, which



HOUSTON. LEFT—MORGAN LINE TERMINALS AND AT EXTREME LEFT DISTRIBUTING WAREHOUSE OF THE CARNEGIE STEEL CO. RIGHT—LONG REACH WHARF AND WAREHOUSES OF THE HOUSTON COMPRESS CO. ON THE HOUSTON SHIP CHANNEL



Public Grain Elevator and Section of Wharves on North Side of Turning Basin at Houston

fully utilized will provide berthing space for about fifteen hundred vessels with necessary sheds, warehouses and railway connections. The navigation district will develop this as rapidly as needed, or will execute long term leases to private parties for industrial or terminal purposes.

Shipside terminals were constructed at the turning basin and Manchester by the city of Houston with the proceeds of a $3,000,000 bond issue, providing 3649 lineal feet of wharves and railway connection to trunk lines. The navigation district, including all of Harris county, through an enabling act passed by the Texas state legislature on Aug. 21, 1921, took over by lease all of the city of Houston terminal facilities, and at once proceeded to enlarge them.

During the period 1922-24 four new concrete wharves were constructed on the north side of the turning basin with a total length of 2140 feet; in 1926 a public grain elevator, with a capacity of 1,000,000 bushels was added to the facilities. During 1928 wharves 14 and 15 were completed providing two additional ship berths on the north side. In addition to these new wharves numerous extensions and improvements have been made to the existing structures and several miles of railroad trackage have been added to the port yard.

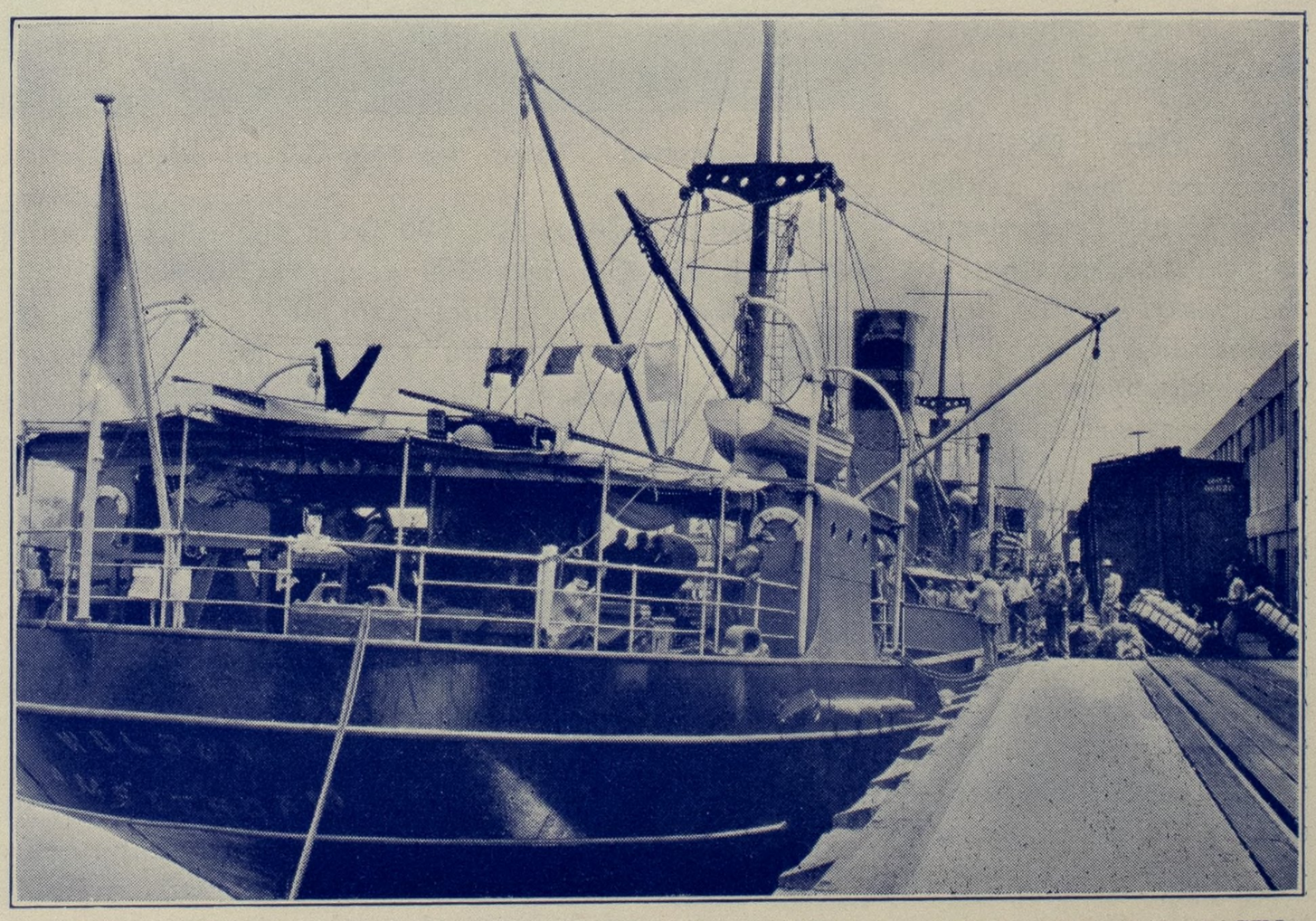
North of the turning basin is located the large classification yard capable of holding 4000 cars which is the clearing house of the public belt railroad and the various lines serving Houston. The initial unit of this yard has already been constructed. From this classification yard several lead tracks reach the water front to serve both sides of the channel as well as the new terminals.

On July 1, 1924, there was put in operation the Port Terminal Railroad association which operates all the facilities of the public belt railroad, connecting with the main trunk lines entering the city and providing for a neutral switching organization to handle all traffic to and from the port terminals and industries with equal dispatch and without discrimination to any of the 19 railroads reaching the city. This arrangement is proving an entirely satisfactory solution of the railroad and port terminal problem and with the extension of the public belt railroad, service along each side of the channel to every industry is guaranteed.

There has just been completed a further extension of over five miles of public belt railroad to reach the location of the Shell Petroleum Corp. This will give a total of 58.41 miles of track being operated by the Port Terminal Railroad association.

The facilities of the port are well protected by a splendid system of fire mains and connections with the city of Houston water supply, as well as auxiliary electric fire pumps, and the entire port is patrolled by one of the latest diesel electric fire boats, the PORT OF HOUSTON. This vessel, constructed in 1926, is 125 feet long, 27-foot beam, 8½ foot draft, equipped with two 500-horsepower Winton diesel engines with an auxiliary unit of 165-horsepower driving Westinghouse motor generators, which in turn operate motors for two Worthington centrifugal pumps with a capacity of 7000 gallons of water per minute at 150 pounds pressure, which can be delivered through 39 fire nozzles, including the deck and turret monitor noz-

(*Continued on Page* 64)



LOADING COTTON, HOUSTON—CONCRETE WAREHOUSE ALONG TURNING BASIN

Galveston—Largest Cotton Port

Seaport for the Southwest—Rail Connections Excellent—Modern Warehouses and Grain Elevators—Ample Berthing for Large Ships

By E. S. Holliday

GALVESTON is peculiarly fortunate in being susceptible to development along four general lines: as an industrial center, as a port, for its resort attractions, and for its agricultural interest. In all probability, however, Galveston is best known throughout the world as one of America's leading ports. As the Southwest becomes a greater producing part of the United States Galveston will gain as the principal outlet for the commodities from states adjacent to Texas, and for importing commodities needed to further develop the resources of this section.

With rail and water facilities so closely co-ordinated that it takes but little time for incoming freight to be "spotted" at the side of a vessel, Galveston can lay claim to one of the best arranged port systems in the world. All facilities are located on one side of the channel, and are so arranged that it is not necessary for a steamer to shift to different piers for all of her cargo. Loading records have been made in practically every commodity that is handled through this port, and at the same time facilities have not been taxed to their utmost capacity. It is largely due to the excellent arrangement of the wharf front facilities that Galveston has been able to handle the tremendous amount of cargo it does in a year's time.

In loading cargo there is no ferrying from one point to another, and lighterage is unknown and has been for the past thirty years. Ships with a draft of 32 feet when loaded have easily navigated the channel, though the depth of the channel is listed at the present time by the United States engineers as 30 feet. The dredging of Galveston channel to 32 feet is now nearing completion which will allow still deeper draft vessels to enter the port, thus meeting the steadily growing demand for more space aboard vessels plying out of this port.

Galveston has 32 piers and berthing space for more than 100 ocean going vessels. Serving the wharves there are 245 miles of standard gage railway trackage. On the waterfront proper there are more than 5,000,000 square feet of covered storage space. The Galveston Wharf Co., one-third owned by the city, has 12,400 lineal feet of improved channel frontage; the Southern Pacific Terminal Co. has 1350 feet; the Mexican Petroleum Corp. has 630 feet; the Gulf Refining Co. has 250 feet; a total of 14,630 feet. This frontage including the slips gives a total of 41,792 feet. The average yearly business passing over Galveston docks is in excess of $675,000,000.



Galveston. Thirty-two Piers Accommodate 100 Ocean Vessels

The cotton storage facilities at Galveston provide space for handling 2,000,000 bales without tiering, if tiered the normal crop of Texas and Oklahoma could be stored without undue congestion. Galveston is the largest cotton port in the world, and has handled during the present season 2,962,680 bales. There are four grain elevators with a combined capacity of 5,050,000 bushels. During the present season 30,000,000 bushels of grain passed through these elevators without congestion.

During the past two years expenditures for new construction on the water front have approximated $2,500,000; this included the rebuilding of Piers 23 to 26 making a fireproof modern structure and the construction of new terminal facilities at Pier 9 which is double decked giving storage to 75,000 bales of cotton. Construction will start shortly on a huge addition to the grain elevator known as elevator B of the Galveston Wharf Co. When completed this elevator will have a total capacity of 5,864,242 bushels, bringing the total elevator capacity of the port to 8,864,243 bushels. Back of the waterfront, the Cotton Concentration Co. is now at work constructing the fourth unit of a fireproof cotton warehouse that will cover sixteen square blocks of ground and will care for 200,000 bales of cotton.

The harbor is landlocked and is separated from the Gulf of Mexico by Galveston island with its great seawall system, giving absolute protection to all of the city and the harbor back of it. The entrance lies between two strong jetties extending out into the open sea, but sufficiently wide to allow safe passage in any weather, the width being 2200 feet.

The greater part of the public wharves at Galveston are owned and operated by the Galveston Wharf Co., a private corporation in which the city of Galveston has approximately one-third interest. This company controls affairs insofar as its own terminals are concerned. Pilot charges are fixed by the state and all of the wharfage and switching charges are fixed by the interstate commerce commission, or the state railway commission. The chamber of commerce can furnish tariffs on request. Galveston harbor lies on the north side of the east end of Galveston island,

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The author, E. S. Holliday, is assistant secretary of the Galveston chamber of commerce. This article was prepared at the request of the editor.

just inside Galveston bay, and is about six miles by water from the open gulf. The approach to the channel over the bar is marked by Heald Bank lightship about 27 miles from the entrance to the jetties, which line each side of the channel. Beacon lights are placed by the jetties and on the extremity, while Bolivar lighthouse is located opposite the anchorage. The length of the improved channel from the gulf to its westerly or northerly limit is about 10 miles, of which 4½ miles lies along the wharf font of Galveston between Bolivar roads and the docks of the Southern Pacific Terminal Co. This latter channel has been dredged 1200 feet wide and usually has a ruling depth of over 32 feet. The dimensions of the outer channel from Bolivar roads to the bar is 800 feet wide by 32½ foot depth. All of the above depths are at mean low tide. The tidal current in the above channel are not strong except at times of unusually strong northerly or southerly winds.



Loading Cotton for Export. Galveston Handles an Average of 3,000,000 Bales Each Year

Safe anchorage for many large vessels is found in Bolivar roads between the jetties just off Bolivar lighthouse. This is the official anchorage ground designated by the government. The harbor has a mean range of tide of 1 foot and a spring range of tide of 1.3 feet. The high water interval is as follows: Bolivar point light, 5 hours 15 minutes; Galveston, Twentieth street, 5 hours 50 minutes; Morgan's point, 8 hours 50 minutes.

Dry Dock and Repair Facilities

Galveston is well equipped to handle all kinds of marine repairs, rebuilding or remodeling work which might be needed. The principal ship repair plant is the Galveston Dry Dock & Construction Co., which has a 10,000-ton floating dry dock, a marine railway of 1200 tons capacity and machine shops and foundries equipped to handle practically any class of work required. This company is located opposite pier 23 on Galveston channel. The dry dock can lift a vessel weighing 10,000 tons and 550 feet in length. It is built in two sections one of 3600 tons capacity and the second of 6400 tons capacity, and is capable of operating as two separate units. Other facilities include machine, plate, pipe, blacksmith, woodworking and paint shops equipped for handling any class of marine repair work for hulls, machinery or boilers. The marine railway is capable of lifting vessels up to 1200 tons and is used principally for small wooden steamers, barges and tug boats. Ten vessels undergoing repairs can be accommodated simultaneously.

There are a number of smaller companies equipped to do ship repair work from ordinary deck and engine repairs to heavy machine work and castings of all kinds.

Among the facilities offered to shipping are surveyors representing various services such as: American Bureau of Shipping; Registro Italiano; Lloyds Register; London salvage, and French Bureau Veritas. There are also surveyors representing the New York board of underwriters, and other insurance groups, both domestic and foreign, as well as several independent surveyors all well qualified to act in any regular capacity. Galveston provides excellent bunker facilities for both coal and ore. Vessels calling at this port are not only well cared for but they are bunkered and made ready for sea in the shortest possible time. As an oil bunkering port it has the advantage of proximity to both Texas and Mexican fields. Fuel oil prices are usually lower than at any other port in the country.

The Galveston Coal Co. at Pier 34 has a coal bunkering capacity of 80 tons per hour, and a capacity in floating equipment of 320 tons per hour. It has a storage capacity of 25,000 tons. At the company's plant at Pier 34, vessels are bunkered by means of a steel steeple 96 feet high with a steel boom, 62 feet long, reaching over the vessels and carrying 2½ tons per hour. One 15-ton Brownhoist crane and one 10-ton Interstate crane completes the equipment.

Oil bunkers may be had at almost any section of the waterfront. Several of the larger companies maintain pipe lines connected with large storage tanks immediately back of the waterfront. Almost any grade of oil which may be required is available



GALVESTON. LEFT—TYPICAL WHARF OF GALVESTON WHARF CO. CLEAN, VENTILATED, AUTOMATIC SPRINKLERS. RIGHT—IMPORTING SUGAR FROM CUBA

here. The Magnolia Petroleum Co. has an 8-inch pipe line extending within the slip at Pier 40, along the T head of Piers 40 and 39, and within the slip at Pier 39. The storage capacity is ample. The Mexican Petroleum Corp. in addition to the modern pier and storage plant in the East end, also has a 10-inch pipe line extending inside the slip and around the T head of Pier 41. The Gulf Refining Co. has its own plant at Pier 5, maintaining six storage tanks, in the East end, and in addition to serving vessels with bunker oil, have loading racks capable of handling 42 tank cars at one time. The Rio Bravo Oil Co. is located at Pier C Southern Pacific docks, equipped with two 10-inch pipe lines, and has a storage capacity of 605,000 barrels.

The fumigation service at Galveston is well organized and everything is done to avoid unnecessary delay. Work of this nature is carried out at any time of day or night. The system is scientific and the personnel is well trained and efficient. In addition to the vessel proper the service is equipped to handle fumigation of commodities such as broom corn, etc., which have to be fumigated to meet the requirements of foreign countries, as well as the fumigation of food products and other articles which may become infested.

Galveston offers an ideal location for industrial development, particularly to those concerns which are in need of and who market their products through water transportation. There are available within the city, desirable industrial sites in the business area, providing many acres in space suitable for industry; it has cheap fuel, surplus labor, and when the Southwestern markets are exploited, it is easy to turn to the East with its enormous population for the sale of surplus production.

Transactions handled through the Galveston Clearing House association during 1928 reached an aggregate of $1,804,222,000 an increase of $58,733,000.

During the past five years Galveston has made the following gains relative to the city's growth: Population, 20.1 per cent; telephone installations, 28.5 per cent; water connections, 31.7 per cent; postal receipts, 25.9 per cent; school census 34.1 per cent. The Port of Galveston is destined for a great future as commerce develops.

Gulf Ship Repair Facilities Are Good

MOBILE is fortunate in having two large conveniently located, fully equipped ship repair plants. These are the Alabama Dry Dock & Shipbuilding Co. and the Todd Shipbuilding & Dry Dock Co. Inc. Both plants are able to repair and completely recondition ships of large tonnage. The Alabama Dry Dock company is also well equipped for building ships and barges both in steel and wood.

The Todd plant at Mobile is being steadily improved due to the demand for ship repair facilities on account of the large tonnage of shipping now using this port. It is the intention to build up an efficient modern ship repair plant at Mobile and as a part of this program additional land was recently purchased which permitted the extension of the frontage on the river channel, some 600 feet. Extensive dredging operations have been under way so that the water in way of the piers and slips will have a depth of at least 30 feet. This work was performed by the Alabama state board dredge ALABAMA. Two new piers 600 and 700 feet long respectively are under construction and will provide two slips or basins, one 210 feet wide by 650 feet long and the other 220 feet wide by 800 feet long. Each pier has a standard gage railroad track for its full length and connecting with the lines serving the port. Among additions to the shop facilities is a new coppersmith shop.

The Todd corporation recently purchased a five-section, 10,000-ton floating drydock. Three of these sections, each nearly 100 feet long by 88 feet wide, and some 30 feet high, were towed to Mobile to be added to one of the floating docks at that plant. This increased the drydocking facilities at the Mobile plant to a total lifting capacity of 21,000 tons. The two other sections of the floating drydock were towed to the Todd plant at New Orleans.

Expansion Became Necessary

All of this development was found necessary because the existing plant had been pushed to the limit of its capacity. There were times when as many as six ships in addition to ships actually on the floating docks were berthed in some manner at the plant undergoing repairs.

At Galveston, Texas, ship repairs are carried out in an efficient manner by the Galveston Dry Dock & Construction Co. This plant is equipped with one 550-foot floating drydock built in two sections with a total lifting capacity of 10,000 tons. There are also a number of machine shops and foundries capable of doing ordinary marine repairs.

The repair facilities at Houston consist of a number of machine shops and foundries well equipped to carry out ordinary repairs, both hull and engine. The drydocking facilities consist of three marine railways, the maximum lifting capacity 600 tons.

New Orleans, as the second largest port in the United States requires extensive ship repair facilities. The

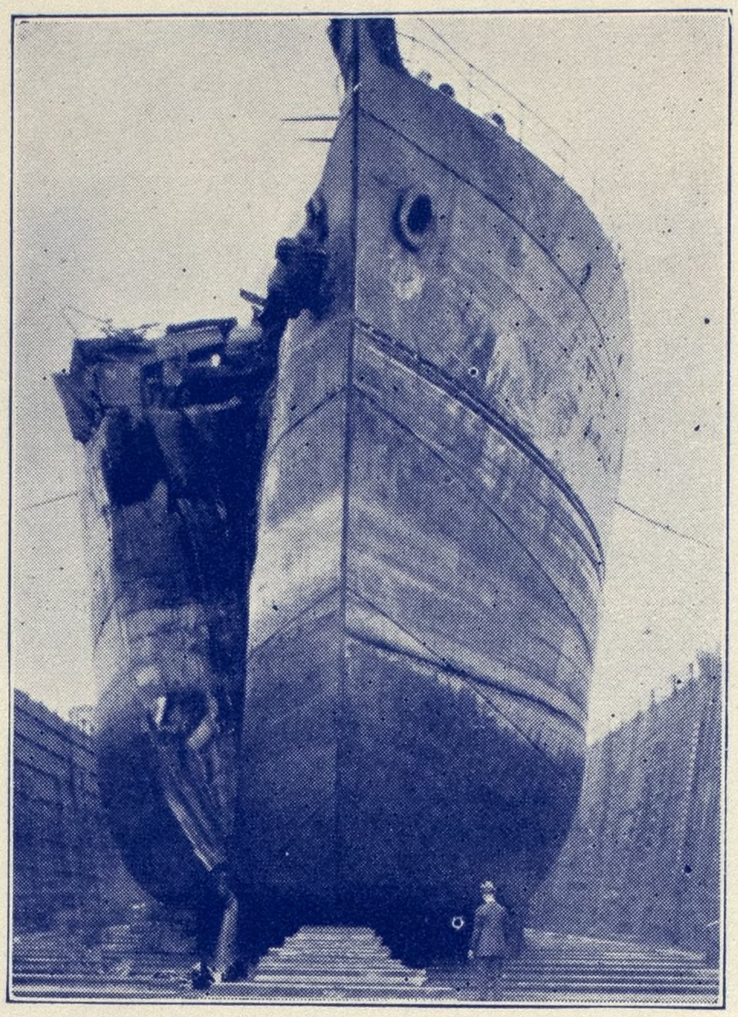


SHIPS IN FOR REPAIRS AT THE TODD SHIPYARD PLANT, MOBILE

outstanding ship repair and shipbuilding plant at New Orleans is the Jahncke Dry Docks Inc. Then there is the Johnson Iron Works, Dry Dock & Shipbuilding Co. Inc., which is equipped as the name indicates both for the building and repair of ships. As far as our records show this plant has three floating drydocks, maximum capacity of which is 7000 tons. This company is in a position to do practically any kind of marine repairs. The Todd Shipyards Corp. as indicated above also has a plant at New Orleans for general ship repairs. With the two new sections of the floating drydock which were towed from New York this plant will have a drydocking capacity of 4000 tons.

The largest and most fully equipped ship repair plant at New Orleans is the Jahncke Dry Docks Inc. This yard is equipped to service ships and for drydocking and general marine repairs to all classes of vessels. It is a modern plant covering 14 acres of land located within the limits of the port on the banks of the Mississippi river. The water frontage is approximately one-half mile in length. The buildings are of modern steel and brick construction and are fireproof. Shop tools and machinery are of the latest type suitable for marine repairs. The tools are all electrically driven for maximum flexibility.

One of the features of the plant is a wharf 1500 feet long fitted for the use of compressed air, filtered water,



IN DRY DOCK AT THE JAHNCKE DRY DOCKS PLANT, NEW ORLEANS

steam, oil and oxygen. It also has a standard gage double railroad track connecting with the regular rail systems. There are two drydocks, one of 10,000 tons lifting capacity, 525 feet on the keel blocks, capable of docking steamers up to a draft of 26 feet; and the other of 8000 tons lifting capacity, 450 feet on the keel blocks and capable of docking steamers up to a draft of 20 feet.

The machine and plate shops cover a city block in area and are of steel fireproof construction. The shops are served by two 25-ton overhead electric cranes with two 400-foot steel runways reaching into storage yard. All machines are electric motor drive to permit individual operation. Located between the plate and machine shops are the sheet metal shop, pipe shop, blacksmith shop and brass foundry and these are also fitted with new equipment, electrically operated. Both oxygen and acetylene are piped to the drydocks and wharf for both repairs and to service ships.

Two shifts are worked throughout the year on straight time, thereby reducing to a minimum overtime charges on jobs that are in a hurry. The slogan of the company is "service for ships" and it is the policy of the company reflected by the entire organization to operate the plant on a clear cut business basis in competition at all times on all work with other plants in the country. It is this policy, strictly adhered to, which impresses the shipowner with the reality of the slogan.

Waterways Are Feeders for Gulf Ports

By Major General T. Q. Ashburn, U. S. A.

THE total amount of tonnage carried by the Mississippi-Warrier service during three months of 1918 was 33,728 tons, while the total carried by the same service in 1928 was 1,872,597 tons. This shows a remarkable increase of 1288 per cent.

Most of this tonnage passed through New Orleans and Mobile, and due to this great increase, the terminal facilities at each of these ports have been increased and bettered to a great extent.

The Mississippi-Warrior service, operated by the Inland Waterways Corp. draws its freight from, and distributes it to, forty odd states of the Union,



BARGES OF THE MISSISSIPPI WARRIOR SERVICE OF THE INLAND WATERWAYS CORP. AT GOVERNMENT ORE AND COAL HANDLING PLANT AT MOBILE. CAPACITY 500 TONS PER HOUR. SUCH EQUIPMENT NECESSARY FOR PROPER USE OF WATERWAYS

and has been a very large factor in balancing for the middle west its economic disadvantages brought about by the opening of the Panama canal, and the consequent readjustment of rail rates to meet this new competition.

The developments of the ports of Mobile and New Orleans have kept pace with the enormous expansion of the barge line, and in their turn other Gulf ports, such as Houston and Galveston, have strained every effort to keep pace or exceed the developments of Mobile and New Orleans.

To meet the competition of the barge line the Illinois Central has developed, and will probably further develop, Gulfport, Miss., as a principal terminal for this railroad.

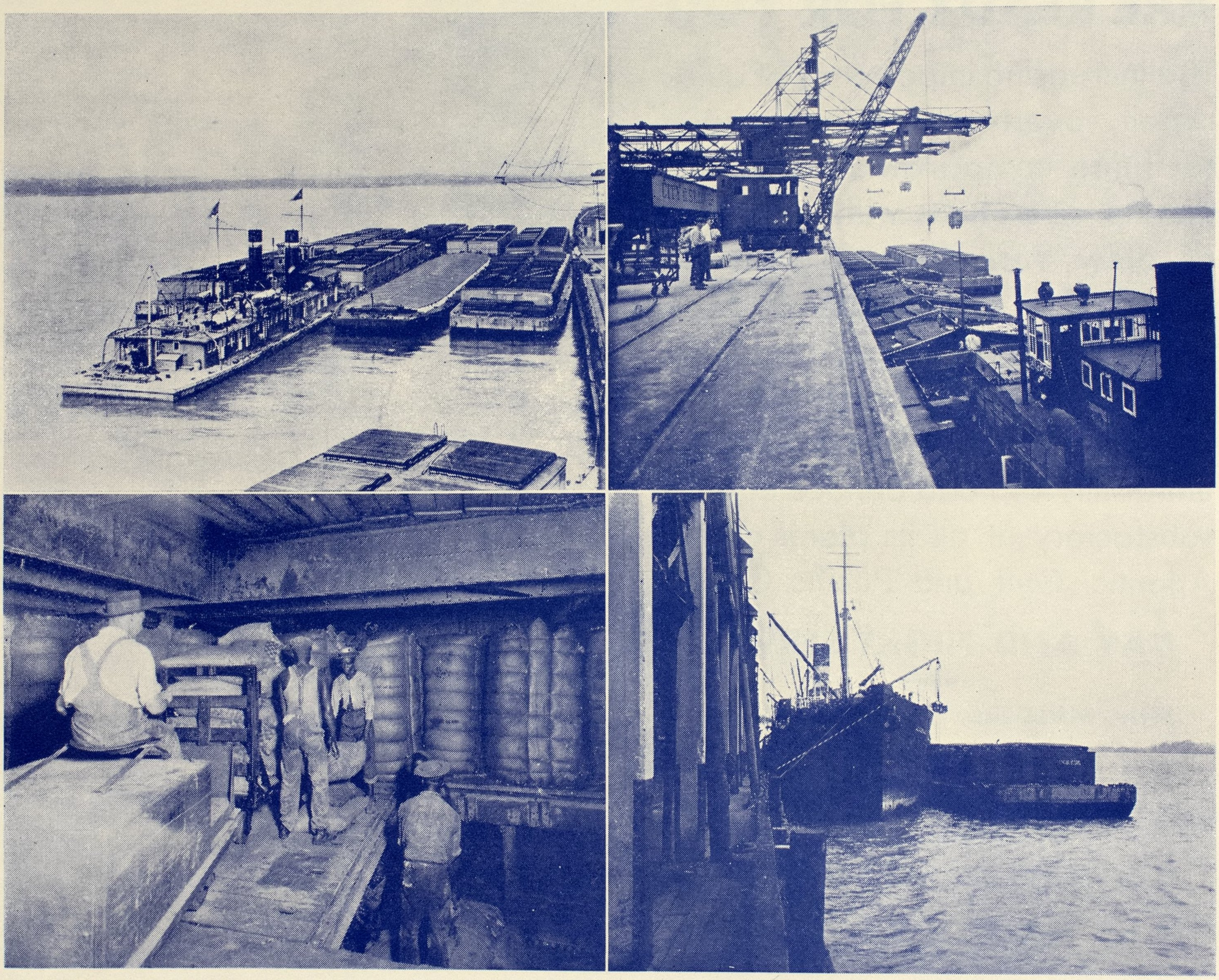
Due to the success of the Barge line, there will soon be an intracoastal canal extending from Point Isabel, (Brownsville, Texas) to the Mississippi river, serving the states of Louisiana and Texas.

Georgia is seeking the development and utilization of the Apalachicola and the Chattahoochee. Florida is seeking a cross state canal, and it will not be long till every Gulf port on the coast will find itself in a position where it must have adequate terminals to meet the business that must pass through them.

The most logical and practically undeveloped market the United States has lies in South America, so it would be wise for the Gulf ports to look ahead and prepare for such development on a broad scale.

With the further development of the Inland Waterways Corp., and extension of its joint rail and water rates, more and more of the whole nation will be touched by its activities, and more and more will the importance of the Gulf ports increase.

With the interior water communication furnished by the Inland Waterways Corp., and the exterior communication furnished by the Gulf itself, these cities will naturally find themselves the center of manufacturing activities, because they are so situated that raw materials can be collected cheaply, and the finished products can be distributed cheaply. Such transportation facilities and convenient location in relation to raw materials is ideal for any line of manufacturing.



ACTIVITIES OF FEDERAL BARGE LINE OF INLAND WATERWAYS CORP. UPPER LEFT—TOW AT BIENVILLE STREET WHARF, NEW ORLEANS. UPPER RIGHT—LOADING SELF PROPELLED BARGES AT MUNICIPAL WHARF, ST. LOUIS. LOWER LEFT—INTERIOR OF BARGE SHOWING METHOD OF STOWING CARGO. LOWER RIGHT—COPPER INGOTS FROM CHILE TRANSFERRED FROM STEAMER TO BARGE AT NEW ORLEANS

Of the 1928 figures, divisions are as follows: southbound traffic, local, tons, 243,671; interline, tons, 402,305; total, 645,979; northbound traffic, local, tons, 464,860; interline, tons, 324,724; total, 789,584. The ratio of interline and local tonnage is practically on a fifty-fifty basis, due to complete figures of 708,531 tons local and 727,029 tons interline.

With steadily growing traffic there can be no question of the value of the pioneer efforts of the government.

The author, Major General T. Q. Ashburn, is chairman of the board of the Inland Waterways Corp. which is owned by the United States government.

Houston an Ocean Port

(*Continued from Page* 53)

zles. The fire boat was built by the Bethlehem Shipbuilding Corp. from designs furnished by Cox & Stevens, New York naval architects, at a cost, fully equipped, of $314,000.

Private enterprise has been quick to see the advantages of this new port and many industrial plants and wharves have been established along the channel, until there are now 50 or more located on its banks with an estimated capital investment of over $150 000 000 and with a daily payroll of about $90,000. In addition to the above there are 32 industries located on the light draft channel above the turning basin which have an estimated capital investment of over $20,000,000 and a daily payroll of approximately $8000.

Electric Power is Provided

Adequate electric power for the operation of the many industries located along the waterway and adjacent thereto is provided by the Houston Lighting & Power Co., on the ship channel, which now has a capacity of approximately 128,000 kilowatts with transmission lines in all directions from the port, serving many of the surrounding towns and cities within a radius of 100 miles.

Houston is essentially an oil port, located as it is in the midst of all the coastal oil fields, with pipe lines radiating in all directions to the great producing fields of Texas, Louisiana and Oklahoma, with one pipe line extending to Wyoming, and there is a storage capacity of something like 35,000,000 barrels located adjacent to the ship channel. Exceptionally convenient bunker facilities have been provided by the Houston Oil Terminal Co., at the turning basin with approximately 128,000 barrels of fuel oil storage and pipe lines extending to all the public wharves on the south side and to the Houston Compress Co. wharves, through which vessels can be furnished bunkers at the rate of 2000 barrels per hour, while taking on or discharging cargo. These lines have been extended to serve the new wharves on the north side of the channel.

Bunker oil can also be obtained by private arrangements with some of the oil refineries located farther down the channel. United States shipping board vessels are bunkered under contract at Houston.

The Channel Fuel Co. carries a considerable stock of bunker coal on hand and is equipped to bunker ships at their wharves on the channel.

Passenger traffic through the port of Houston has been steadily increasing. The French line, Ozean line, North German Lloyd line and the Navigation-Libera-Triestna, now maintain regular schedules to Houston and these schedules are supplemented by combination passenger and freight carriers which call at this port frequently. The first passenger motor ship to enter the Gulf of Mexico on regular passenger run, the RIO BRAVO of the Ozean line, for which Wilkens and Biehl are agents, arrived at this port on Oct. 28 and sailed on Oct. 29, 1924. The Ozean line operates from Houston to Hamburg and Bremen via Mexican ports and Southampton, England. The French line operates from Houston to Havre, returning via Spain and the Canary Islands; the North German Lloyd line from Houston to Bremen and Hamburg and the Navigation-Libera-Triestna to Havana, Canary Islands, Barcelona and Mediterranean ports.

The port of Houston is operated by the navigation and canal commission of five members, serving without pay, who are appointed two by the city and two by the county commissioners and the chairman by the city and county commissioners in joint session. These port commissioners serve for a period of two years, the term expiring alternate years. Under this board the affairs are handled by the director of the port.

The board controls the commercial activities of the port and the construction and maintenance of the terminal facilities, and through co-operation with the Federal government the construction and improvement of the waterway.

What Shipping Board Says

Among many of the constructive activities of the United States shipping board is the preparation, in collaboration with the corps of engineers of the army, of complete reports on the various ports of the country. In a review of such a report, recently completed, of the port of Houston, the board said:

"Petroleum products exceeded in tonnage all other commodities imported at Houston during the period covered by the report and in point of export tonnage the same commodity exceeded all other exports. Cotton took second place among the exports with an annual average movement of almost 205,000 tons for the period from 1917 to 1926, inclusive.

"With the construction of modern terminal facilities both at the turning basin and at Manchester, two miles below the turning basin, Houston is well equipped to handle in an efficient and expeditious manner the commerce which may flow through her port. With her large cotton compresses, warehouses, wharves, piers, grain elevators, belt line railroad, classification yard, bunkering facilities, and with favorable railway rates the port is in a fair way of making a still larger contribution to world trade.

"A great deal of credit is due to the Houston port commission and to the local commercial interests for their progressive attitude toward the port."

From the Engineers Report

And this is what the army engineers say in connection with the same report:

"Houston furnishes a noteworthy example of a successful port at an inland point originally inaccessible to ocean vessels. Situated on Buffalo bayou, approximately 50 miles from the sea, its present position as an important gateway for import and export trade is due in some measure to its location as a railroad center, but principally to the enterprise of the city in carrying out a comprehensive plan and policy for the development and utilization of the port.

"The commerce of the port of Houston has grown from 1,161,424 tons in 1917 to 12,981,113 tons in 1928. Of the total waterborne commerce at the port during the calendar year 1928, 366,825 tons were imports, 4,500,000 tons exports, 919,382 tons coastwise receipts, and 5,270,848 tons coastwise shipments. Petroleum products and iron and steel manufactures were the principal commodities imported; petroleum products, cotton and cotton seed products the principal exports; petroleum products, iron and steel manufacturers, canned goods and sugar the principal commodities received coastwise; while the coastwise shipments were petroleum products, copper, cotton and rice.

"The modern terminal facilities both at the turning basis and at Manchester, two miles below the turning basin, are served by a belt line railway connecting with all the railroads at the port. There were 43 piers and wharves at the port in 1926 used for transportation purposes, including two grain loading berths serving a new 1,000,000 bushel capacity grain elevator. These facilities were served by 54 steamship lines plying in the foreign service and 9 lines operating coastwise."

Personal Sketches of Marine Men

Ernest Lee Jahncke, Assistant Secretary of the Navy

By Lynne M. Lamm

IN HIS selection to this important post the President has named an experienced shipbuilder and ship repairer who knows at first hand about construction and upkeep of ships.

HIS training will be of value in initiating methods of improvement in operation of navy yards and naval bases and in keeping ships in commission at less cost.

IN ADDITION to his experience as an engineer he has taken an influential part in public affairs. This serves as an excellent background for his administrative duties.

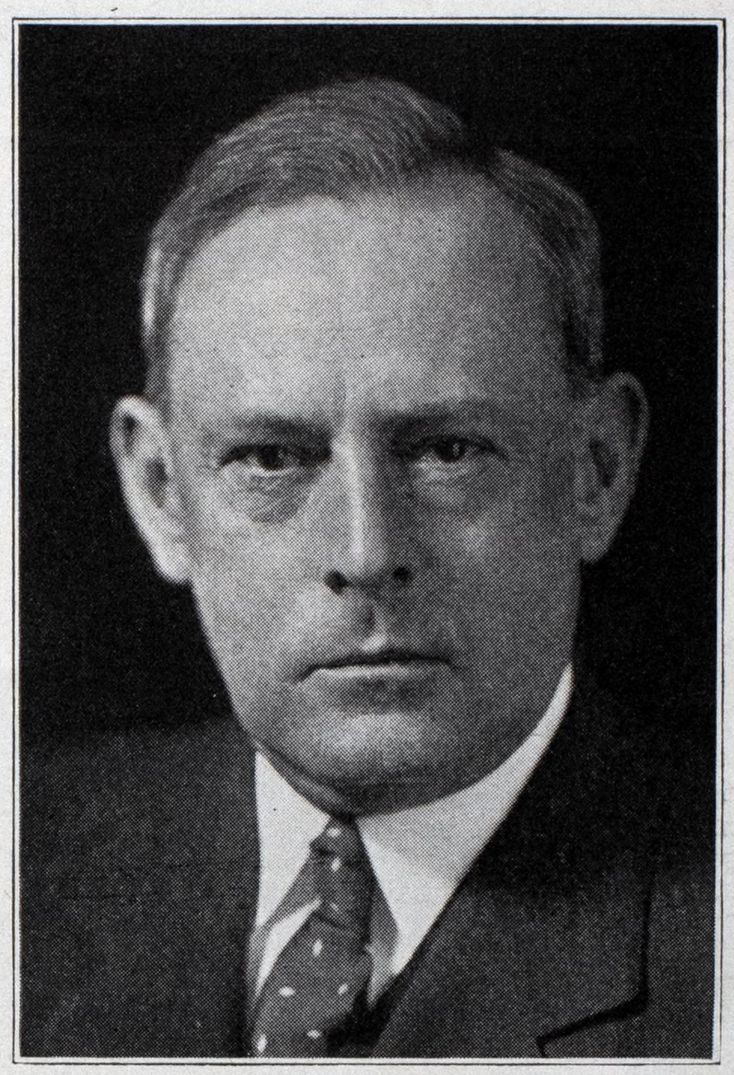


Photo by Bachrach

YACHTSMEN now have the say in the navy department, for President Hoover in appointing his secretary and assistant secretary of the navy took advantage of the boating devotees to select Secretary Adams and Assistant Secretary Jahncke, both of whom for many years have been enthusiastic about boating and other water sports.

Ernest Lee Jahncke, who had been prominently mentioned at one time for secretary of the navy but who was given the assistant secretaryship, not only was president of the Jahncke Dry Docks Inc. and the Jahncke Service Inc., both of New Orleans, but he is as well a member of the Southern Yacht club of New Orleans, his home, and the New York Yacht club.

It is reported in Washington that President Hoover first took particular interest in Mr. Jahncke on account of the latter's work in connection with the Mississippi flood relief two years ago. Significance was attached to the selection of Commodore Jahncke to be the assistant secretary because it was regarded at the time as the first of a number of appointments to be made by the President in recognition of the South.

The appointment was considered a further indication that those with engineering training will be looked upon by this administration with favor. President Hoover was the founder of the American Engineering council. One of the purposes of this organization is to encourage engineers to take an active interest in public affairs. The high regard which Mr. Hoover entertains for the engineer is thought to have had a bearing on the selection of Commodore Jahncke who is actively identified with the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Society of Naval Architects and Marine Engineers, and the Louisiana Engineering society. During the Hoover campaign he cooperated closely with the Hoover-for-President Engineers committee. Commodore Jahncke is an alumnus of Tulane College of Technology and began his commercial career as a draftsman for the St. Tammany shipyard.

The new assistant secretary, who was born in New Orleans, on Oct. 13, 1880, is a lieutenant commander in the United States naval reserve. He graduated from Tulane University of New Orleans in the class of 1899 receiving degrees of bachelor and master of engineering.

In addition to the organizations with which he has already been mentioned as being associated he is director of the Canal Bank & Trust Co. New Orleans and vice president of the board of administrators of Tulane University. He is also a member of the National Foreign Trade council of New York, president of the Reparations commission, New Orleans, and member of the board of trustees of Newcomb College for Women, New Orleans. Secretary Jahncke is also a member of the International Olympic committee and was Louisiana State chairman for the celebration of navy day in 1925, 1926, 1927 and 1928.

The secretary is also a member of the following clubs: Boston, Pickwick, Country, Audubon, and Matairie Golf, all of New Orleans, and India House and University, of New York and the Metropolitan of Washington.

While Commodore Jahncke is president of the National Republican club of Louisiana and has always been

an active Republican, it is not considered that his selection for the navy post was made as a political plum but it is said to have been based on the President's appreciation of his familiarity with many problems intimately connected with navy administration.

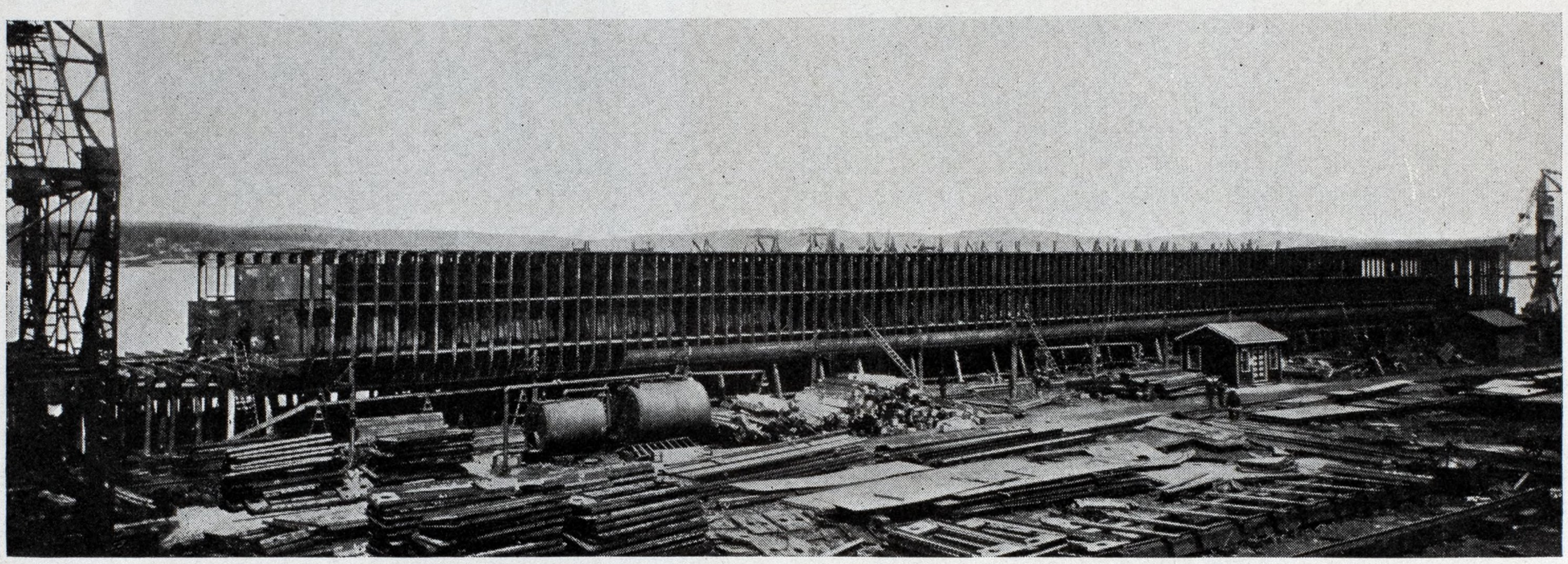
Mrs. Jahncke was Cora Van Voorhies Stanton, granddaughter of Edwin M. Stanton, President Lincoln's secretary of war. They have four children, Stanton, Adele Townsend, Ernest Lee Jr., and Cora Stanton Jahncke.

During the presidential campaign the new secretary served as chairman of the Republican finance committee and was a member of the national Republican committee's advisory council. In 1915 he was king of Carnival at New Orleans and he has also served as president of the New Orleans Association of Commerce and was commodore of the Southern Yacht club.

The new secretary acquired an early interest in boats. It is said that as a youngster he sailed tiny ships for pleasure, later entering the business of repairing seagoing vessels in his own dry docks. During the war his firm built ships for the government.

Shortly before the present administration came into power Mr. Jahncke appeared before the naval affairs committee of the house of representatives opposing an amendment to the naval bill providing for the leasing of the floating dry dock at New Orleans by the navy department. He made a favorable impression on members of the house at that time.

Canadian Freighter Under Construction



Hull 24—To be named Stadacona—Under construction at Midland Shipbuilding Co. yards, Midland, Ont., for Canada Steamship Lines Ltd. She is 596 feet in length over all; length between perpendiculars, 580 feet; breadth, 60 feet; molded depth, 32 feet. Her capacity is approximately 440,000 bushels. Her speed will be approximately 12 miles per hour loaded.

Earnings Show Increase in First Quarter

The report of the Atlantic, Gulf & West Indies Steamship Co. for the quarter ended March 31, 1929 shows a net income of $1,423,344 after deductions for depreciation, taxes and charges which, after allowing for dividend requirements on 5 per cent preferred stock, is equivalent to $6.27 per share earned on 199,512 shares of no par common stock. This compares with $651,655 or $2.40 per share on common for the first quarter of 1928. The net income for March was $589,315 after these charges, against $312,803 in March, 1928.

Open Bids for Cruisers

Bids were opened by the navy department on June 15 for the construction of the first five light cruisers to be built in private and government yards as the first step in the recently authorized 15-cruiser program.

The Bethlehem Shipbuilding Corp., New York, was the lowest bidder on the two cruisers to be built in private yards, submitting an estimate of $10,753,000 for each of the ships. The New York Shipbuilding Co., Camden, N. J., bid $10,903,000 each and the Newport News Shipbuilding & Dry Dock, Newport News, Va., bid $11,130,000 for each vessel. The bids call for delivery within 36 to 38 months from the date of contract.

Collier is Launched

The collier BERWINDVALE, built for the Berwind-White Coal Mining Co., was launched at the plant of the Fore River Shipbuilding Co., Quincy, Mass. on June 8 and will soon be followed by a sister ship. These vessels are the first built in this country to be equipped with pulverized coal burning apparatus. They will have a coal carrying capacity of 7000 tons and a speed of 10½ knots. One will have scotch boilers and reciprocating engines and the other water tube boilers and geared turbines.

Marine Insurance Agency Sold by Board

The shipping board on June 19 announced that it had sold to seven New York and New Jersey companies engaged in the marine insurance business, its agency for the underwriting of protection and idemnity policies. Only damage within the ship itself is covered by the insurance. The board explained that its object is to give American insurance companies opportunity to develop this branch of marine insurance along with the development of private American shipping. The private companies paid only $10,000 for the agency.

The companies taking over the agency, known as the Marine Office of America, include the following: American Insurance Co., and Firemen's Iusurance Co., Newark, N. J.; American Eagle Fire Insurance Co.; Continental Insurance Co.; Fidelity Phoenix Insurance Co.; Hanover Fire Insurance Co., New York, and Glen Falls Insurance Co., Glen Falls, N. Y.

Safety of Life at Sea

(*Continued from Page* 21)

any other fitting, appliance or apparatus, provided that such government has been satisfied by suitable trials that it is at least as effective as that specified in the regulations. When any government so accepts a new fitting, appliance or apparatus it is to communicate that fact to the other governments with, upon request, a report of the trials made.

Final Comments

ADMIRAL RICHMOND in completing his review of the work of the conference said: "When I come myself to review this brief summary I have attempted of the work done, I feel that some of you may feel disappointed at not seeing particular measures, to which you may have attached special importance, not embodied precisely in the form you desire. But against that I would ask you to bear in mind how much the convention, as a whole, owes to the frank manner in which you have dealt with one another throughout the conference. You have pooled your knowledge; you have tested it by the experience of all. Far more, I need hardly remind you, can be done by the nations acting together than by the separate action of any single nation.

"I now submit the convention for your approval. I do so with confidence, in the firm belief that your labors will produce the results at which we have aimed—increased safety of life at sea without the imposition of burden upon shipping which might injure that great, that superlatively important industry. Every proposal has been subjected to a scrutiny of the most rigorous nature. The advances which the convention makes are, I venture to think, profitable to the world at large.

"With these words I now move that the convention in its intirety be adopted and accepted by the delegations here present in the names of their respective governments."

His excellency the German ambassador, Dr. Sthamer, as head of the German delegation seconded the motion for adoption of the conference in a graceful speech, following which the motion for the adoption of the convention was carried unanimously by acclamation.

Senator M. Rio, president of the French delegation and chairman of the committee on Drafting addressed the conference in a very interesting speech in which he said in part:

"Perfection in the construction of ships; elaboration of detailed and strict rules for preventing the occurrence of accidents of every sort; determination of the type and number of life saving appliances, insuring the maximum efficiency in case of shipwreck; such are the fundamental bases of the work which we have built up.

"We must, however, recognize that the problem of getting passengers away from a ship is not completely solved, since science and naval technique have not yet placed at our disposal methods to enable that perilous maneuver to be accomplished in every case with certainty and absolute safety.

"Therefore, being convinced that there still remains something to be done in this direction, we feel that we must all undertake not to lose sight of this vital question. We must study it and cause it to be studied by our seamen and our technical services. We must communicate one to another any useful information which we may be able to acquire on the subject.

"I cannot conclude these few remarks without a tribute to the spirit which has prevailed throughout all our labors. Never before have men assembled with such a noble purpose, so anxious to reach agreement, to place their ideas side by side and to seek in common for the best solutions. Good will, conciliation, agreement—these words sum up the attitude of each of us in the vast creative effort which has given rise to the new convention."

The final meeting of the conference, held at the foreign office on the afternoon of May 31, with Vice Admiral Sir Herbert Richmond, K. C. B., the president, in the chair, was addressed by Sir Philip Cunliffe-Lister, president of the board of trade. Sir Philip closed the conference saying in part:

"We in this country have been proud to have been the convenors of a conference which has achieved such remarkable results. I know that the instrument to which you have appended your signatures contains a common accord and practical results, and that nowhere throughout that document will you find a formula which has been devised to conceal some difference. On the contrary, the aim of the drafting has been not to devise formulae which may mean two things, but to make sure that, since we are so completely agreed, the text shall forever set forth the completeness of that agreement. You have achieved results which will be of signal service to the cause of safety at sea and which will do not a little to cement international amity. I congratulate you, and I bid you farewell."

Board Receives Bids for Purchase of Lines

Bids for purchase of the American Diamond lines and America France line, which were opened at the shipping board offices on June 4, revealed offers ranging from $14 to $25.38 per ton, each offer contemplating an agreement to maintain adequate service, as prescribed by the board's specifications, for a minimum period of five years from the date of sale.

The highest bid was that offered by the United States Lines Inc., through its president, Paul W. Chapman, which organization recently purchased the United States lines from the shipping board. The offer of this group, which is on the basis of $25.38 per ton, amounts to $3,981,343.26 for the combined fleets of the two lines. The bid of Chapman on each line is conditional upon buying both lines and contemplates the purchase of 18 ships.

Offers at the rate of $14 per ton were submitted by the managing operators of the services, the Black Diamond Steamship Corp., managing operators for the American Diamond lines, offering $1,567,314 for 13 ships of the line it is operating, and the Cosmopolitan Shipping Co., managing operators for the America France line, offering $1,094,002 for all nine of the vessels of the line it is operating.

An offer at the rate of $16.70 a ton was made by Moore and McCormack & Co. Inc., of New York, for 12 of the 14 ships of the American Diamond lines. This offer amounted to $1,706,155.50.

The American Diamond lines and America France line are cargo services operated in the North Atlantic trade between North Atlantic ports of the United States and French, Dutch and Belgian ports. The American Diamond lines are operated to Antwerp and Rotterdam, and the America France line operates to Havre, Dunkirk, St. Nazaire, Bordeaux.

The vessels of these lines are of the steel cargo type ranging from 7825 deadweight tons to 9789 deadweight tons. The aggregate tonnage of both fleets is 199,880.

America France line: COLLAMER, INDEPENDENCE HALL, LIBERTY, MCKEESPORT, PIPESTONE COUNTY, SARCOXIE, SCHODACK, VINCENT, WAUKEGAN.

American Diamond lines: ALABAMA, AMBRIDGE, ANACONDA, BELLEPLINE, CITY OF ALTON, COAHOMA COUNTY, INNOKO, SACANDAGA, SAC CITY, SACO, TOMALVA, WEST ARROW, WEST ELDARA, WYTHEVILLE.

Boiler Water Treatment

(*Continued from Page* 28)

fact that flues and tubes in some sections might be safely operated throughout a lifetime, while, in other sections, tubes and flues must be replaced at intervals as short as six or eight months.

In the accompanying table the samples of fresh water were taken as follows: 1, Mississippi river, (Paducah, Oct. 1927); 2, Lake Michigan (Great Lakes, Ill., Aug. 1927); 3, Well (Chicago Heights, Ill., May, 1927); 4, Well (Edgemont, Nebr., June, 1927).

Impurities in Grains Per Gallon in Four Fresh Waters

	1	2	3	4
Organic & volatile	5.02	.09	8.09	12.63
Sodium chloride	1.29	1.02	1.50	15.61
Sodium sulphate	.49	.....	.....	.....
Calcium carbonate	3.16	4.77	3.98	4.52
Calcium sulphate	.90	1.70	27.97	18.88
Magnesium carbonate	.22	1.75	15.69	5.74
Magnesium chloride	.....	.....	.....	1.50
Carbonic acid	1.37	5.76	13.99	4.43

The cities and stations on the Great Lakes are blessed with a splendid boiler water supply, inexhaustible and almost unchanging. Analysis number 2, taken at our naval training station, on Lake Michigan, in August, will differ very slightly from one taken at the same place in December, this is because of the large basin storage.

Compare this beautiful supply with analysis number 3, Chicago Heights is only a short distance inland from Lake Michigan yet this water supply, which is characteristic of all inland well waters of Illinois and Indiana is so hard as to make treatment costly while, without treatment, steam boilers cannot use it and render service. Even heating systems in private houses are destroyed in their usefulness in very short periods of time. Naturally large industries avoid these towns, and the tendency for extension of the city boundries of Chicago finds one of its reasons in the superiority of its water supply.

Interest in sample number 4, lies in the fact that the water issues from an artesian well at a high temperature. It is the supply of the Chicago, Burlington & Quincy railroad at Edgemont, S. Dak., in the region of the Black Hills. In addition to the necessity for an expensive treatment the railroad is embarrassed with the problem of cooling it before it can be used with the standard locomotive injectors. An observer may in the summer time, actually see engine crews placing blocks of ice in the tender tanks of their locomotives, to bring the water down to a temperature low enough to permit of the injectors picking it up.

Despite the fact that in many cases the necessity for, or at least the advisability of water treatment is appreciated, the brain of the executive may well be puzzled in choosing between the several and conflicting plans for the treatment of water supplies, argumentatively and aggressively advanced.

It seems to the writer that frank discussion, without prejudice or rancor, of the comparative advantages and disadvantages of the several general methods of preventing the formation of scale, of minimizing corrosive tendencies and of overcoming foaming, in boilers, would be of the greatest value to the officer who must authorize the expenditures, incident to a water treatment program.

There are three general methods of treating waters for evaporative purposes, as follows:

Method A: The complete treating plant, involving mixing, stirring, settling and filtering apparatus located at each troublesome water supply station. Cost per 1000 gallons evaporated: From 7 to 17 cents. Cost of apparatus: From $20,000 to $50,000 per installation.

Method B: The mere application of chemicals or chemical compounds through a simple system of by-passing into the supply tanks. Cost per 1000 gallons pumped: From 2 to 10 cents. Cost per 1000 gallons evaporated: From 4 to 20 cents. Cost of apparatus: From $75 to $300 per installation.

Method C: The application of the necessary chemicals or chemical compounds directly to the individual boilers. Cost per 1000 gallons evaporated (only) 1 to 4 cents. Cost of apparatus: Nothing.

At first glance, method A, has the greatest appeal. This appeal becomes the greater in the eyes of the non-technical officer, when he hears the method spoken of as "purification."

The facts are that these treating plants do not purify the water. What they do is to take out, by reaction and settlement certain objectionable solids while allowing others to remain, and while adding still others. The solids which are not taken out, such as sodium chloride or common salt, are sometimes the most objectionable of all. The solids which are added are also frequently objectionable, as for instance, sodium sulphate (the result of one of the reactions) which is one of the causes of foaming.

Despite its objections this treatment is by all means the one to be preferred where the solids in the raw water are present in very large proportion and where there is very large consumption of such a supply. This is because, if they are not removed from the water, the solids would build up sludge in the boilers so rapidly as to cause serious difficulty. The first method is the only one which keeps these sludge forming solids from entering the boilers. The foaming tendencies of the waters customarily delivered by the treating plant are recognized as inevitable. This necessitates the use of method C as an auxiliary treatment and ties the two methods together.

It will be noted that for method B, as for method A, two per thousand gallon costs are given. This is because not all of the water treated is customarily evaporated in boilers. Where lime and soda ash are used for reagents or where straight soda ash is used in by-passed solution, the losses due to the difference between the quantity of water treated and that evaporated are of small importance. When precombined chemical compounds are used in this manner, however, these losses become very serious because of the cost of the compounds wasted.

This wastage may easily run to fifty per cent or more depending upon water usage conditions. A few minutes thought will result in an appreciation of these wastages. Water escapes by leakage, by use for sprinkling, boiler washing, station service, fire prevention and practice, as well as in other ways. Having in mind these objections, there are occasional conditions which, nevertheless, make this method the best available.

It is apparent that there is usually marked loss in applying the chemicals to the stores water supply, which is completely obviated by arranging for application to the vessel or station supply tanks or directly to the boilers. In either case, the chemicals merely go into solution, awaiting their injection into the boiler for the necessary reaction.

The use of method C calls for no apparatus or change of current and standard practice. It merely involves the application of the necessary chemical compounds to the boiler through suitable direct feeding devices. This treatment is "boosted" by the application directly to the boiler, after each washout, of a charge of chemicals, compounded to obtain the best physical as well as chemical effect upon old scale formations on the neating surfaces.

It cannot be disputed that the most immediate and effective results in water treatment may be obtained by the application of the method described above as method C.

Electrical Controls

(*Continued from Page* 31)

head of 80 pounds. The electrical control is of the semiautomatic magnetic type, enclosed in a drip proof case, as shown in one of the accompanying illustrations. There is a main line double pole, disconnecting knife switch and adjustable overload relay protection. The panel is also provided with a test link for the purpose of testing the operation of the controller without running the motor. The design follows the customary marine standard of the manufacturer, the equipment being especially adapted for use on shipboard. Adequate provision is made to insure that the contactors and relays will function under all conditions of rolling or pitching of the vessel. It is possible to vary the pump capacity by adjusting the speed of the pump motor with a hand adjustable field rheostat which is totally enclosed and is water proof.

Other electric motor driven pumps are also fitted with the magnetic type of controllers. Among these are, bilge, ballast and fire pump rated at 7½ horsepower, constant speed; the forward and engine room bilge pumps each rated at 1½ horsepower; and the circulating pump for the refrigerating system, rated at 1½ horsepower. The steering gear control is also of the magnetic type with a series relay starter and with jam relay protection. This motor is rated at 3 horsepower. The oil purifiers are equipped with manual type control rated at 1½ horsepower.

All of the magnetic type of controllers on the BLUE SUNOCO can be operated by means of remote control, water proof, push button stations located at convenient points from which it may be necessary to start and stop the various auxiliaries. All of the control apparatus on this vessel was designed for operation at 115 volts direct current.

Repair S. S. River Orontes

ON MAY 2, off Quarantine, New York harbor the British freight steamer RIVER ORONTES and the Spanish liner CRISTOBAL COLON came together in a serious collision. Repairs to the liner were carried out in record time at the Morse plant, Brooklyn, N. Y., as described in the June issue of MARINE REVIEW.

As the RIVER ORONTES had been struck amidships she was much more badly damaged than the Spaniard and she was only kept afloat as long as she was because the CRISTOBAL COLON kept her bow pressed into the great gash which it had been cut in her side. The freighter was finally rushed to shallow water where she was beached with her rail practically at the water's edge. Temporary repairs were made by placing a patch over the torn plates, the cargo was then lightered and the vessel was towed into drydock at the Morse plant of the United Dry Docks Inc. where repairs were carried out.

A contract for the repair of the RIVER ORONTES was awarded on the basis of completing the work in 22 days at a cost of $36,000. One competing bid called for $47,000 and 25 days.

Repairs to this vessel involved the removal of 20 side plates and 18 frames, the rebuilding of the port side of the upper midship house and the renewal of the upper and lower rudder stocks as well as fairing the rudder. The two cargo holds which were filled with water when the ship went down were cleaned, painted and generally placed in first class order. After repairs the vessel will resume her usual service.



DAMAGED IN COLLISION WITH CRISTOBAL COLON—IN DRY DOCK AT THE MORSE PLANT, UNITED DRY DOCK INC. FOR PERMANENT REPAIRS

Eben E. Olcott Dies

Eben Erskine Olcott, president of the Hudson River Day Line, died in New York on June 5 after a year's illness, Mr. Olcott was born in New York on March 11, 1854 and was educated at City College and Columbia School of Mines and became president of the Day line upon the death of Commodore Van Santvoord. Under his enterprising direction the steamers HENDRICK HUDSON, ROBERT FULTON and WASHINGTON IRVING were constructed. He was the leading spirit in the Hudson-Fulton celebration and the creator of the Hudson Tri-Centennial association, the basic organization which so successfully conducted details of the celebration. His personal contribution to this event, in addition to the years of time spent in organizing and preparing the groundwork, was a fullsized duplicate of Robert Fulton's steamboat CLERMONT. Mr. Olcott is survived by his widow, two brothers, one sister and four children.

Up and Down the Great Lakes

To Develop Calumet Harbor—Dalton Elected President—Record Coal Cargo Carried—Launch Canaler and Freighter—Lake Levels

FUNDS have been authorized by the Illinois legislature to proceed with the development of the Calumet harbor on Lake Michigan, as a link in the Lakes-to-Gulf waterway, in a bill which has been signed by the governor of Illinois. Much consideration is being given by state and local agencies in providing terminal facilities for barge tows. Consideration also is being given to a Chicago terminal that will give access to the Calumet and Chicago rivers. The Illinois waterways department plans to locate the Chicago mercantile terminal at the juncture of the Chicago drainage canal and the Chicago river at Damen avenue, south of the Chicago loop. The site includes the abandoned Illinois and Michigan canal, and is improved with a concrete elevator, docks, loading platform and conveniently located switching yards connecting with all the major railroads entering Chicago.

It is estimated by William W. Mulvihill, supervisor of Illinois waterways construction, that at least $800,000 will be needed by the state to improve the site for the freight capacity that will be required.

H. G. Dalton Again Heads Interlake S. S. Co.

H. G. Dalton, prominent in great lakes circles and one of the country's leading authorities on shipping, has been elected president of the Interlake Steamship Co., Cleveland, operators of the second largest fleet of cargo vessels on the great lakes. Mr. Dalton was the first president of the Interlake company, a corporation organized in 1906 by Pickands, Mather & Co. as the Lackawanna Steamship Co. with a capitalization of $1,250,000 and a fleet of seven vessels. In 1913 the name of the company was changed to Interlake Steamship Co., and its capitalization increased to $6,500,000, since which time it has enjoyed continuous growth, operating at present 45 vessels with a carrying capacity of 380,000 tons.

Mr. Dalton's rise in the iron and steel industry has been remarkably rapid. He was born in Cleveland in 1862 and at the age of 16 began work at the Erie ore docks, Cleveland. In 1883 he was taken into the central office of Pickands, Mather & Co., since which time he has been connected with the company. In 1925 he was appointed by President Coolidge to make a thorough study and report on the shipping situation, involving national marine policies. Mr. Dalton in his report recommended centralized authority in fleet control, separation of the Merchant Fleet Corp. and the shipping board and a gradual return to private ownership, a course which largely is being followed.



H. G. DALTON

In addition to being a member of Pickands, Mather & Co., Mr. Dalton is a director of the Central Alloy Steel Co., Massillon, O., first vice president of the Youngstown Sheet & Tube Co. and director of the Steel Co. of Canada.

Other officers just elected by the directors of the Interlake Steamship Co. include H. S. Pickands, vice president; S. E. Bool, secretary and treasurer; C. C. Canfield, assistant secretary and assistant treasurer; H. B. Drake, auditor. The board of directors at its meeting on June 7 declared the regular quarterly dividend of $1.50 a share payable July 1 to stock of record June 15.

The election of Mr. Dalton as president will mean the continuation of well established policies.

Carries Record Cargo

A coal cargo of 16,577 tons, the greatest ever carried on the lakes, was loaded by the steamer LEMOYNE of Canada Steamship lines at Erie, Pa. recently and taken to Fort William for the Canadian National railways. More than 300 coal cars were required to bring this huge cargo to Erie for the LEMOYNE. This cargo beats the previous record held by the steamer HARRY COULBY of Ashtabula by 620 tons.

By entering the field of record coal cargoes, this giant freighter acquired double honors. Already she carries world records for rye, wheat and mixed grains which were established in 1926, 1927 and 1928. Her records are: Rye 538,817 bushels in 1927; wheat, 555,000 bushels in 1928; mixed grains, 551,000 bushels in 1926. The LEMOYNE was built at Midland, Ont. in 1926. She is 633 feet long and has a gross tonnage of 10,480 tons.

Large Self-Propelled Canaler Launched

The St. Lawrence Marine Repair Dock Corp., Ogdensburg, N. Y., June 20 launched the motorship EMPIRE STATE for the Federal Motorships Corp., Buffalo. It is expected that the vessel will create quite a sensation in Great Lakes shipping circles on account of the fact that it is to be operated through the New York State Barge Canal carrying the unprecedented load of 2000 tons. According to the owners, other vessels are to follow as quickly as they can be constructed.

The EMPIRE STATE is 254 ft. long, 43 ft, 6 in. beam and 20 ft. deep. The beam is unusually great for a vessel of this length. The vessel is powered with two 700 horsepower Nelseco diesel engines built by the Electric Boat Corp., New London, Conn., and is said to be the fastest motorship afloat. The vessel is to be operated by the Inland Waterways Transportation Co., headed by George D. MacDonald, Buffalo. The run to seaboard via the Barge canal and the Hudson river will require five days. According to reports, the

vessel is to carry cargoes of finished steel for the small independent concerns in the Youngstown, Pittsburgh, and Cleveland districts on the trip eastward and will return laden with sugar or sulphur. Until the present time lake vessels too large for transiting the canal have been forced to transship their cargoes to barges. The new through-type motorships will eliminate the necessity for transshipment and incidentally will reduce the expense for shipment from the Lakes to eastern seaboard ports. It has been said that these vessels are the answer of shipping men to the rail-water rate war. The new vessels, according to statements, will be able to afford freight rates which the railroads could not even approximate, the only advantage of the rail route being that it extends a faster movement.

Capt. Philip Broderick

Captain Philip Broderick, local manager of the Great Lakes Towing Co., Cleveland, O., died at Mt. Sinai hospital on June 4 at the age of 69. Death was due to pneumonia following an auto accident on May 17 in which he had been injured. Captain Broderick began his marine career as a foremast hand on salt water sailing ships and put into port in every country where ships visited. Later he came to the great lakes and in 1902 was master of the CITY OF VENICE which was lost in a collision on Lake Erie, Captain Broderick and the crew being saved. During the same year he joined the Great Lakes Towing Co.

May Lake Levels

The United States Lake Survey reported the monthly mean stages of the Great Lakes for the month of May as follows:

Lakes	Feet above mean sea level
Superior	602.62
Michigan-Huron	582.01
St. Clair	576.92
Erie	574.28
Ontario	248.27

Lake Superior was 0.02 foot higher than in April and it was 0.47 higher than the May stage of a year ago. Lakes Michigan-Huron were 0.62 foot higher than in April and they were 2.07 feet higher than the May stage of a year ago, 2.25 feet above the average stage of May of the last ten years. Lake Erie was 0.72 foot higher than in April and it was 2.21 feet higher than the May stage of a year ago, 2.05 feet above the average stage of May of the last ten years, 0.14 foot below the high stage of May, 1862, and 3.11 feet above the low stage of May, 1926. Lake Ontario, 0.99 foot higher than in April.

Launch Two Freighters

The Great Lakes bulk freighter WILLIAM G. CLYDE, built at the Lorain yard of the American Ship Building Co. for the Pittsburgh Steamship Co., was launched Saturday, June 22. This vessel which is the first of three building for the Pittsburgh company, has an overall length of 604 feet, 580 ft. at keel, a 60-foot beam and 32-foot depth. A reciprocating engine and scotch boilers will drive this vessel, which is one of two building at Lorain. The second, the HORACE JOHNSON, is expected to be launched some three weeks later. Both vessels are identical.

The third vessel is building at the River Rouge, Mich., plant of the Great Lakes Engineering Works. This boat, which is the MYRON C. TAYLOR, is a typical 600-foot bulk freighter. She is powered with a reciprocating engine deriving power from two hand-fired B. & W. watertube boilers.

Shipping Man Dies

Henry Steinbrenner, one of the oldest and best known shipping operators on the Lakes died Wednesday May 29 from a fractured skull received when he fell against a wash stand in the bathroom of his home. Mr. Steinbrenner was president and manager of the Kinsman Transit Co. and was 80 years of age.

Propose Huge Ship Merger for Lakes

GREAT interest is being focused in Great Lakes circles on the proposed gigantic merger of 17 or 18 independent steamship companies into a corporation of approximately $50,000,000 capital. For the past two years, reports on the subject have been periodically rife but definite proposals are now being offered independent fleet owners by Otis & Co., investment bankers, Cleveland, to participate in a merger of 17 or 18 fleets approximating 115 bulk freighters of about a million deadweight tons. The proposal was made to the fleet owners in the form of a letter setting forth the conditions of the proposed combine. The outcome rests with the fleet operators themselves and according to word from the incorporating company, the final decision on the part of the fleets concerned must be in the hands of Otis & Co. by July 15. The merger is looked upon very favorably by many of the smaller operators except that in a few cases there is some objection to the stipulation that the incorporators will set the price on the vessels which will be absorbed by the corporation.

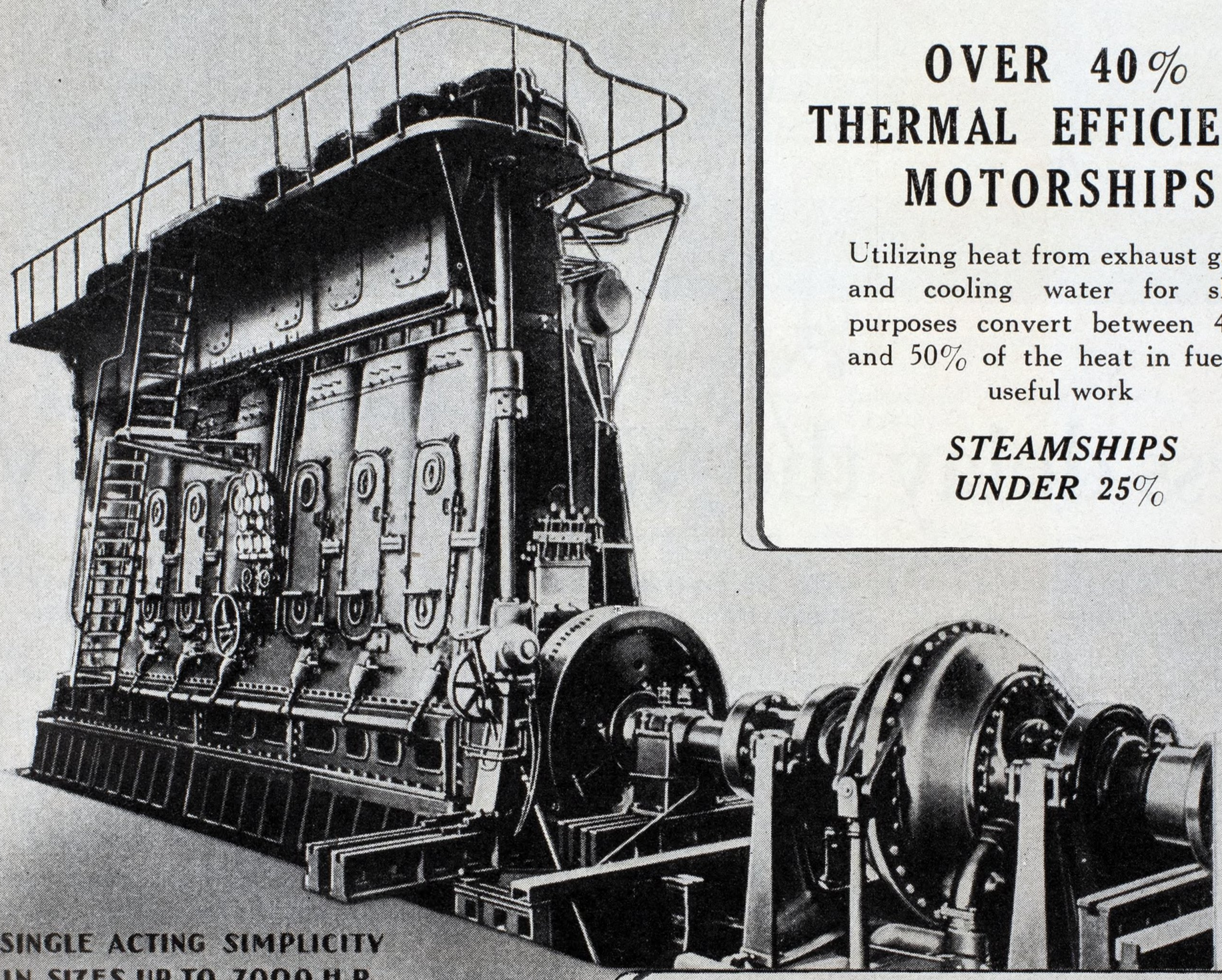
Promoters of big consolidations emphasize the great economies that may be effected through such a combine, not only in giving the individual units the benefit of the most able management available but also in the dispatch and scheduling of vessels. It is understood that the present plan will make it possible for the new corporation to acquire free and clear from liens and claims the ships owned or controlled by the party companies. Present owners will be given option of payments including cash, securities in the new company, or a combination of both. If conditions of the merger are agreed to by the participating companies it is expected that the combine, will be in operation by the middle of August of this year.

No announcement has been made as yet of the executives or directors proposed for the new organization. Among the leading independent interests not included in the merger are the Interlake Steamship Co., operated by Pickands, Mather & Co., the Cleveland Cliffs Iron Co., and M. A. Hanna & Co. The fleet of the proposed new corporation will be larger than that of the Pittsburgh Steamship Co., subsidiary of the United States Steel Corp., at present the largest on the lakes. Among the companies likely to be included in the merger which if consummated will be the greatest event in the history of Great Lakes shipping, are:

Company	Vessels	Capacity per trip	Average size
Hutchinson & Co., mgrs. of Pioneer Steamship Co.	22	190,500	8,659
Great Lakes Steamship Co.	19	144,300	7,600
G. A. Tomlinson	13	114,800	8,831
Boland & Cornelius, Buffalo	17	139,800	8,223
H. K. Oakes, mgr.	16	159,400	9,963
Wilson Transit Co.	11	89,500	8,136
H. M. Steinbrenner	5	46,500	9,300
H. H. Brown & Co.	5	45,300	9,060
Kinney Steamship Co.	5	42,600	8,520
Becker Steamship Co.	5	35,800	7,160
Shenango Steamship	3	34,400	11,467
C. O. Jenkins	5	35,900	7,180
D. Sullivan & Co.	2	15,600	7,800
J. J. Barlum	2	16,900	8,450
Brown & Co.	2	14,000	7,000
R. M. Sellwood	1	6,800	6,800
Buckeye Steamship	1	5,500	5,500

BUSCH-SULZER

TWO-CYCLE DIESEL MARINE ENGINES

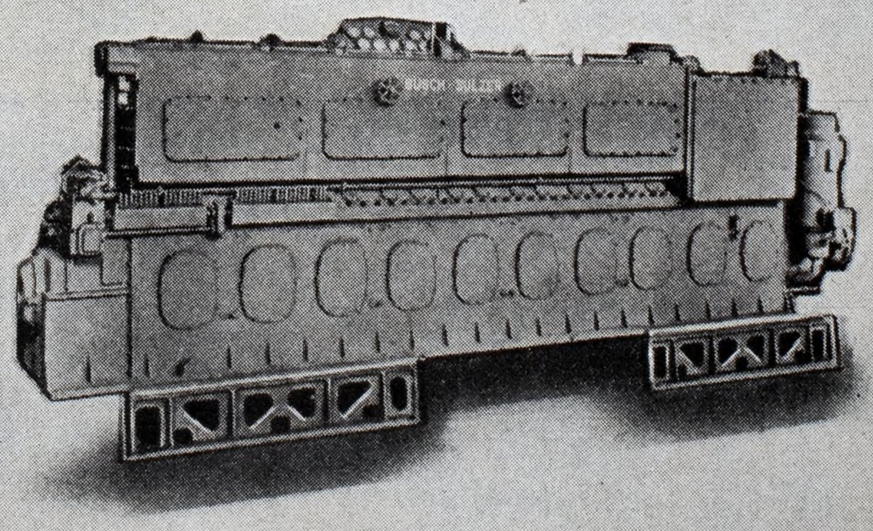


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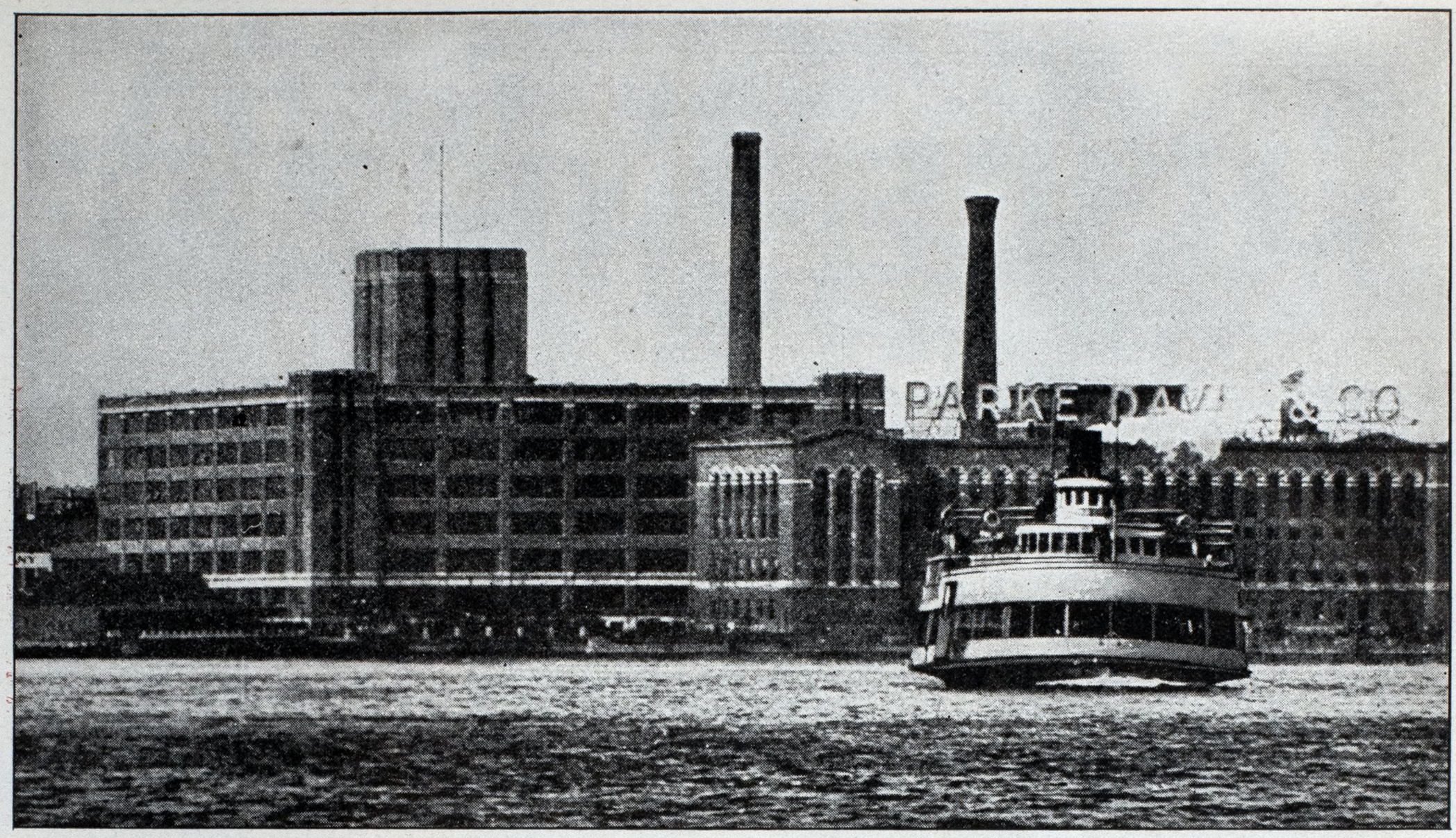
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NOTE: On request we will send you, without obligation, our authoritative marine lubrication treatises: "Steamships with Reciprocating Engines," "Turbine Propelled Steamships" and "Motorships." Write to the above address.

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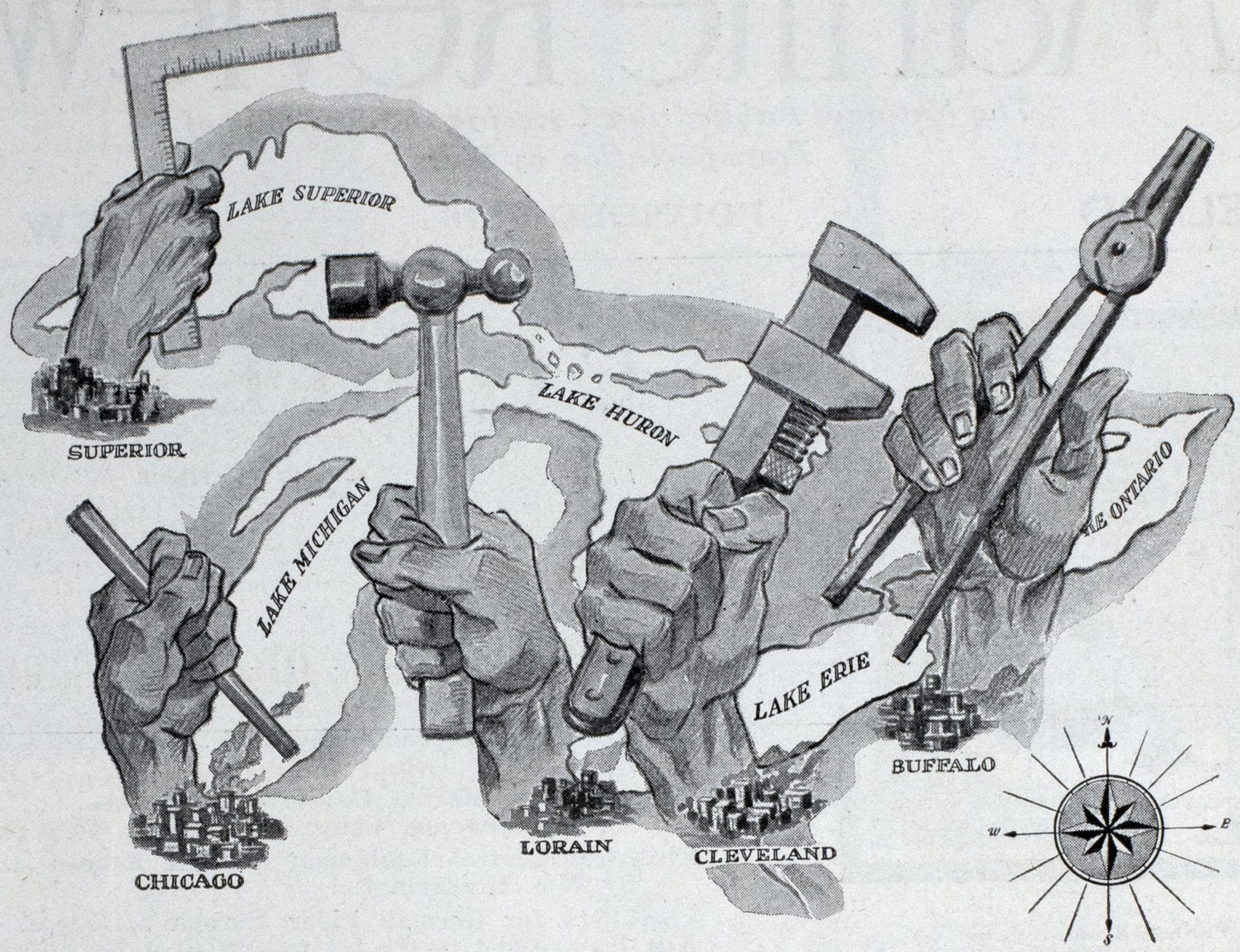
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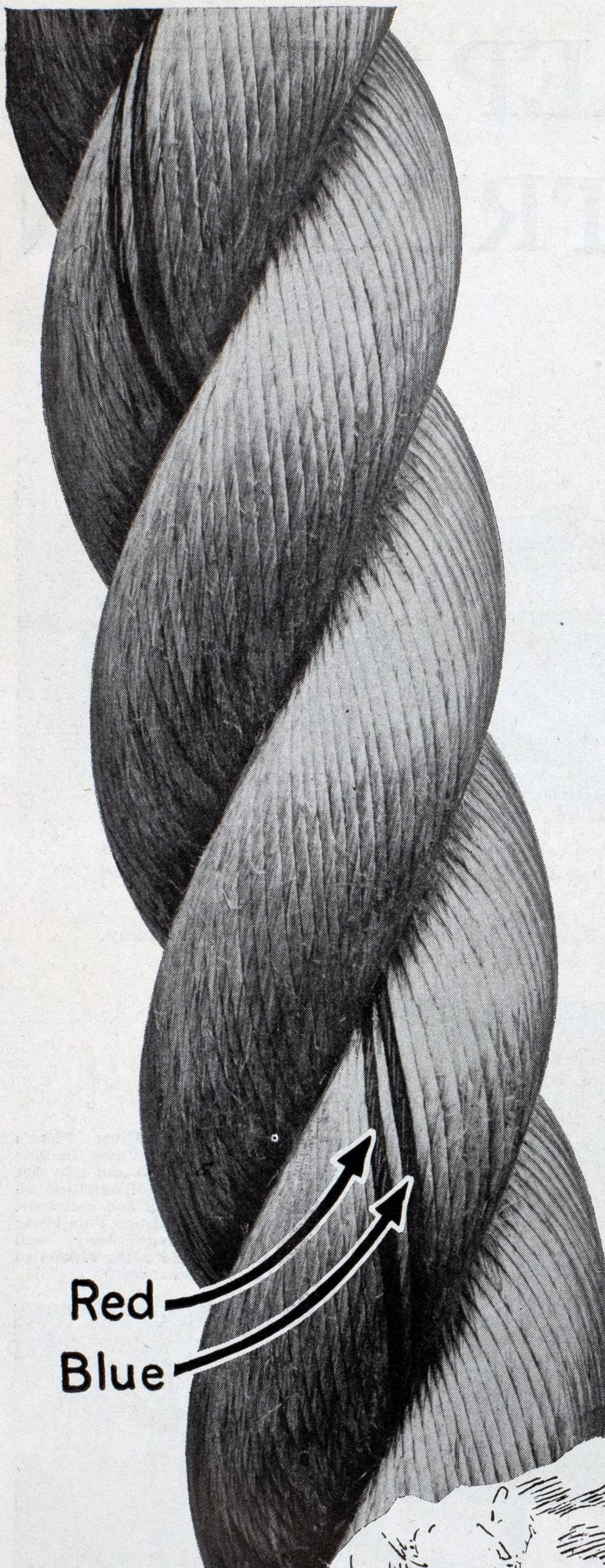
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They realize as well that economical maintenance of such men and materials calls for a big volume of repair business.

That is why, more and more, ship operators are turning to the completely equipped ship building companies for all their repair jobs—the little ones as well as the big rush ones.

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American Ship Building Co.	*American Ship Building Co.*	*Buffalo Dry Dock Company*	*Chicago Ship Building Co.*	*Superior Shipbuilding Co.*



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For many years, it has been possible to positively identify the Guaranteed Columbian *Tape-Marked* Pure Manila Rope by means of the famous red, white and blue *Tape-Marker.* This same *Tape-Marker* is still used and serves as a medium by which the Columbian Rope Company places its signed guarantee right in one strand of the rope. Now, it is possible to identify Columbian at a glance, for every *Tape-Marked* Rope contains

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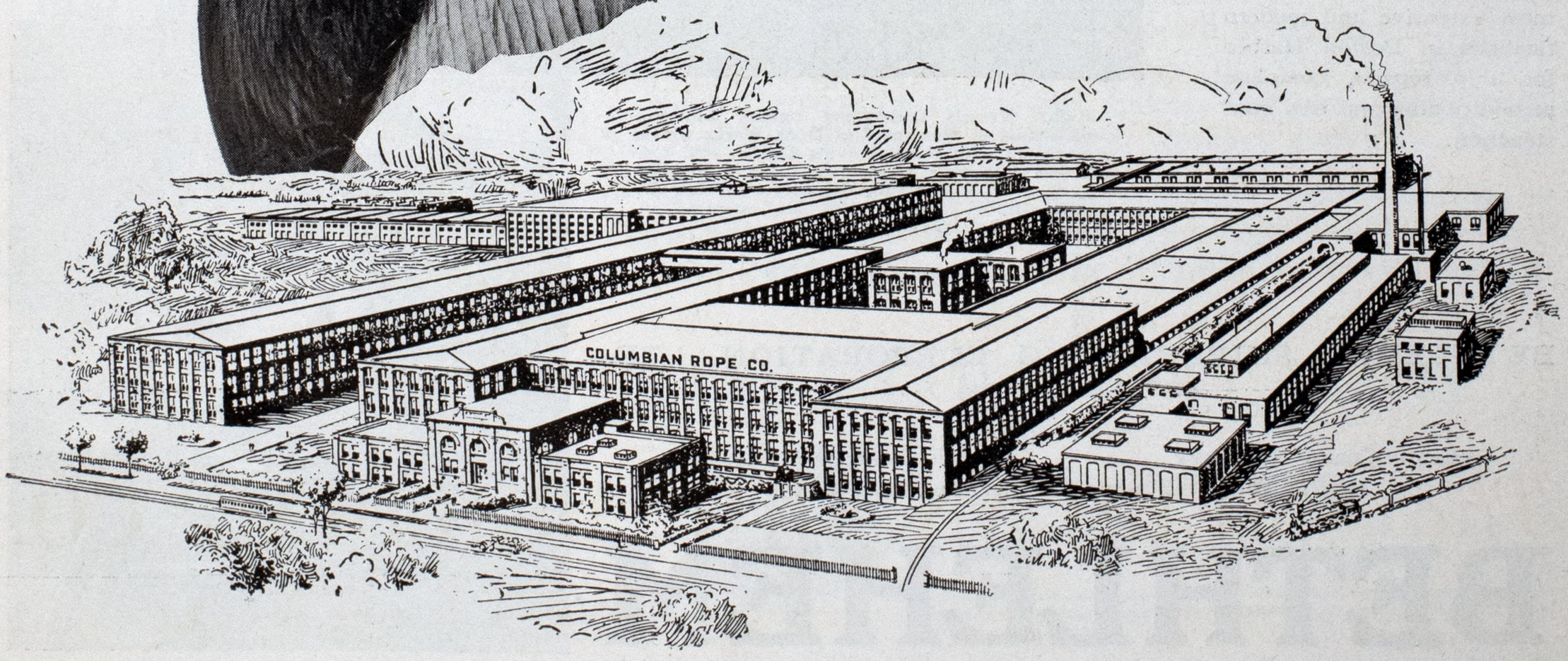
These markers, plainly visible on the surface, are accurate guides for quickly selecting a quality rope which is tangibly guaranteed.

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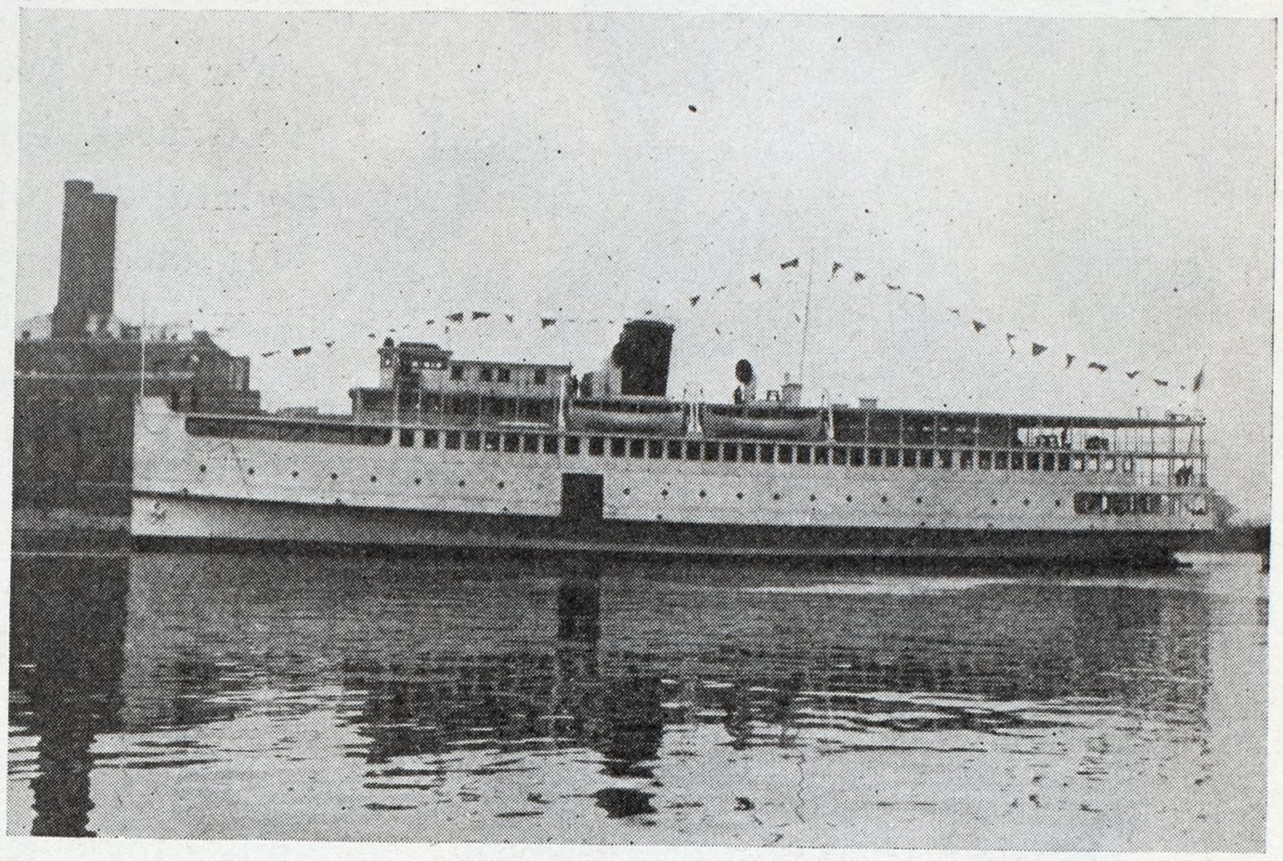
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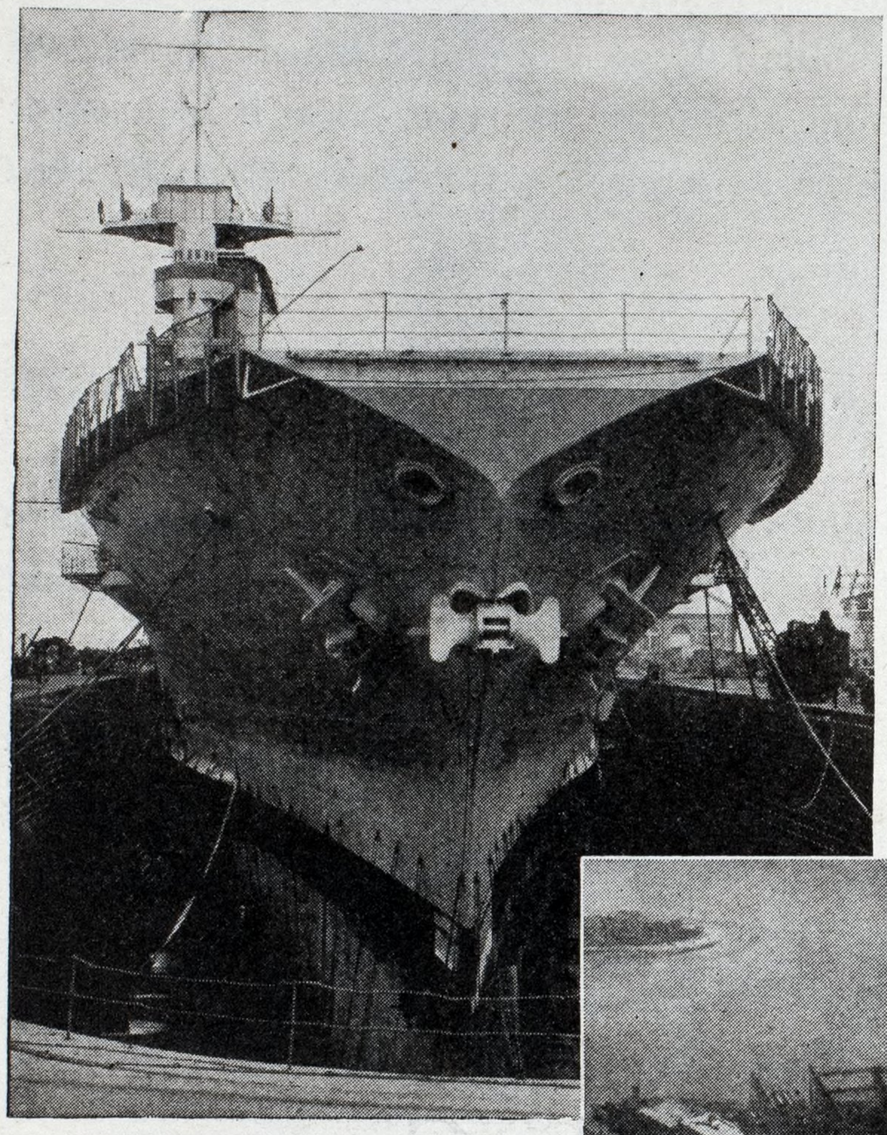


FOR SHIP REPAIRS *and* NEW CONSTRUCTION

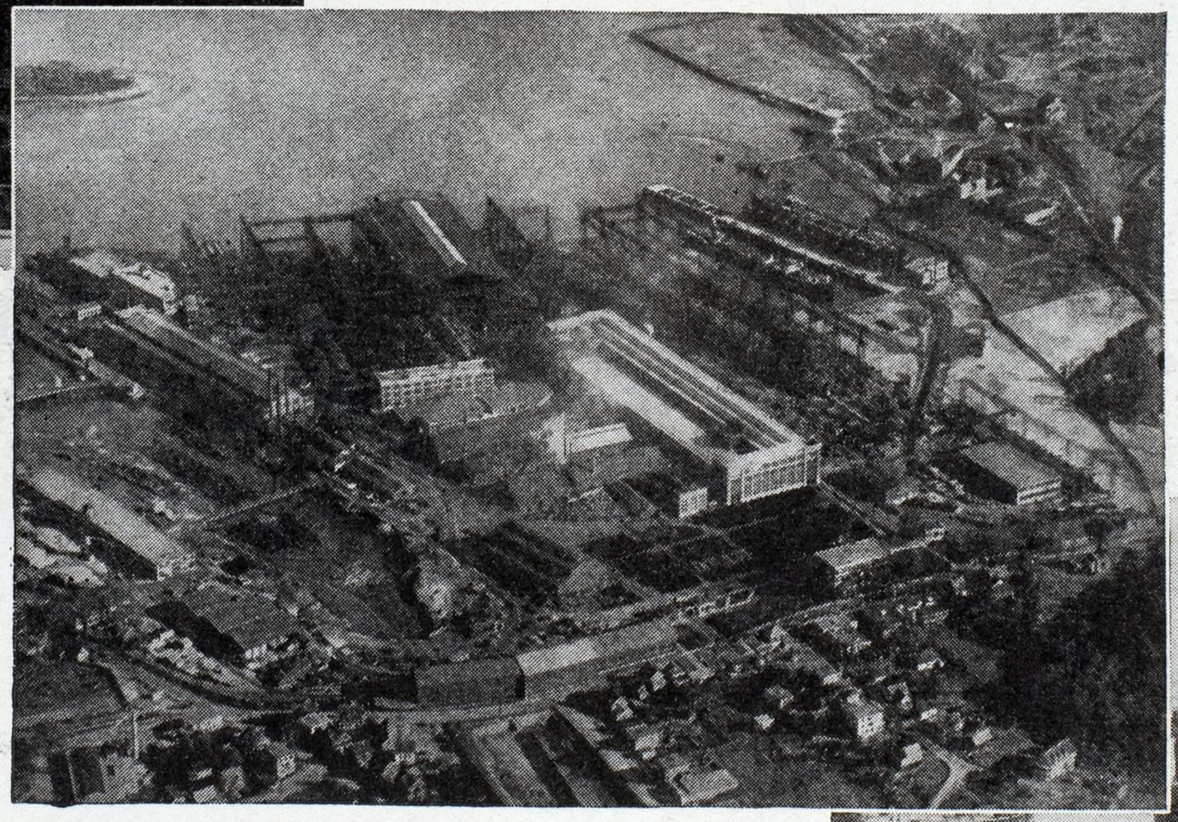


These two vessels emphasize the range of types and sizes of ships that Bethlehem's Fore River Plant is equipped to build.

Above: S. S. Naushon, New England Steamship Company.
Left: U. S. Airplane Carrier Lexington.

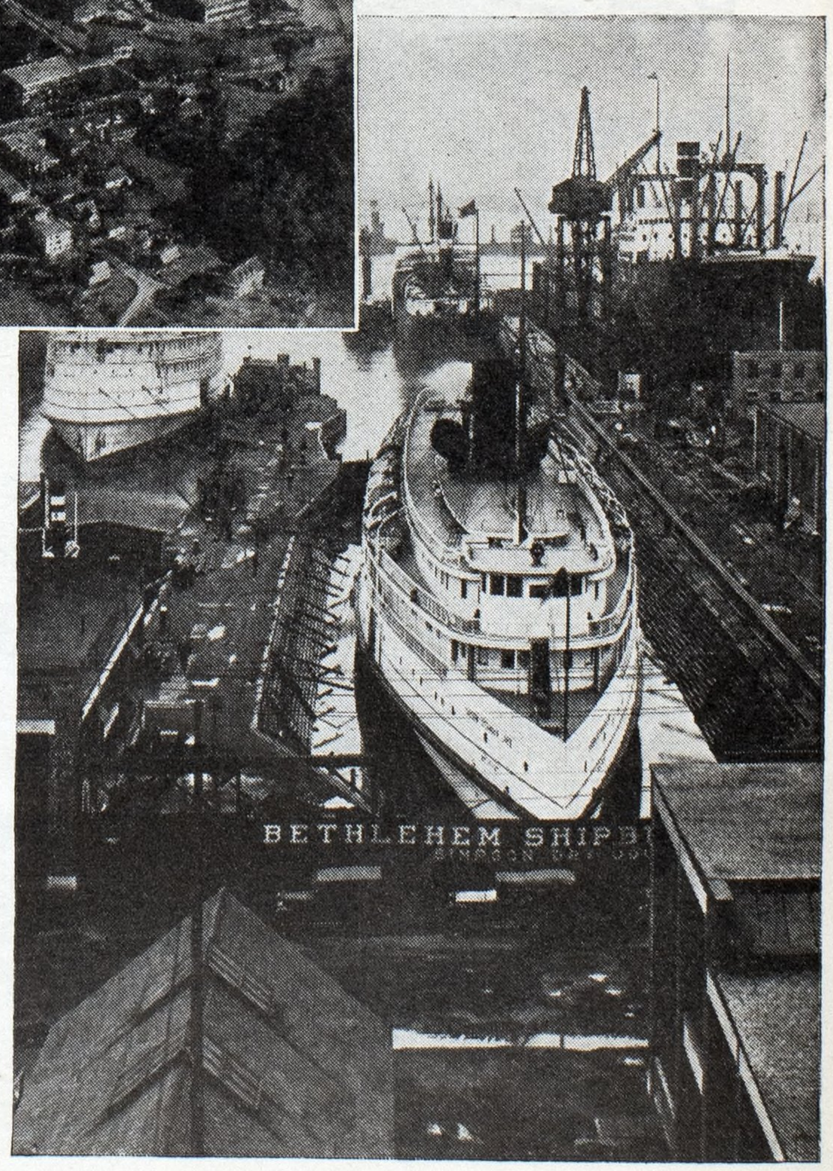


Three large plants comprise Bethlehem's facilities in Boston Harbor. These plants provide excellent means for the repair of vessels bound to or stopping at this port, and are easily accessible from any point on the New England Coast. Bethlehem offers the most extensive and modern facilities in Boston Harbor for ship repairs, complete reconditioning and new construction.



Left: Fore River Plant's shipbuilding facilities include 14 building slips and two wet basins capable of handling all classes of naval and merchant vessels. In addition Fore River Plant is particularly well equipped for making repairs to hulls and machinery.

Right: Vessels undergoing repairs and reconditioning at Simpson Dry Dock Works which is equipped with three Graving Docks, 464, 256 and 164 feet long, respectively, and a floating dry dock of 10,000 tons capacity, 480 feet in length. Shop facilities also are operated in connection with this plant.



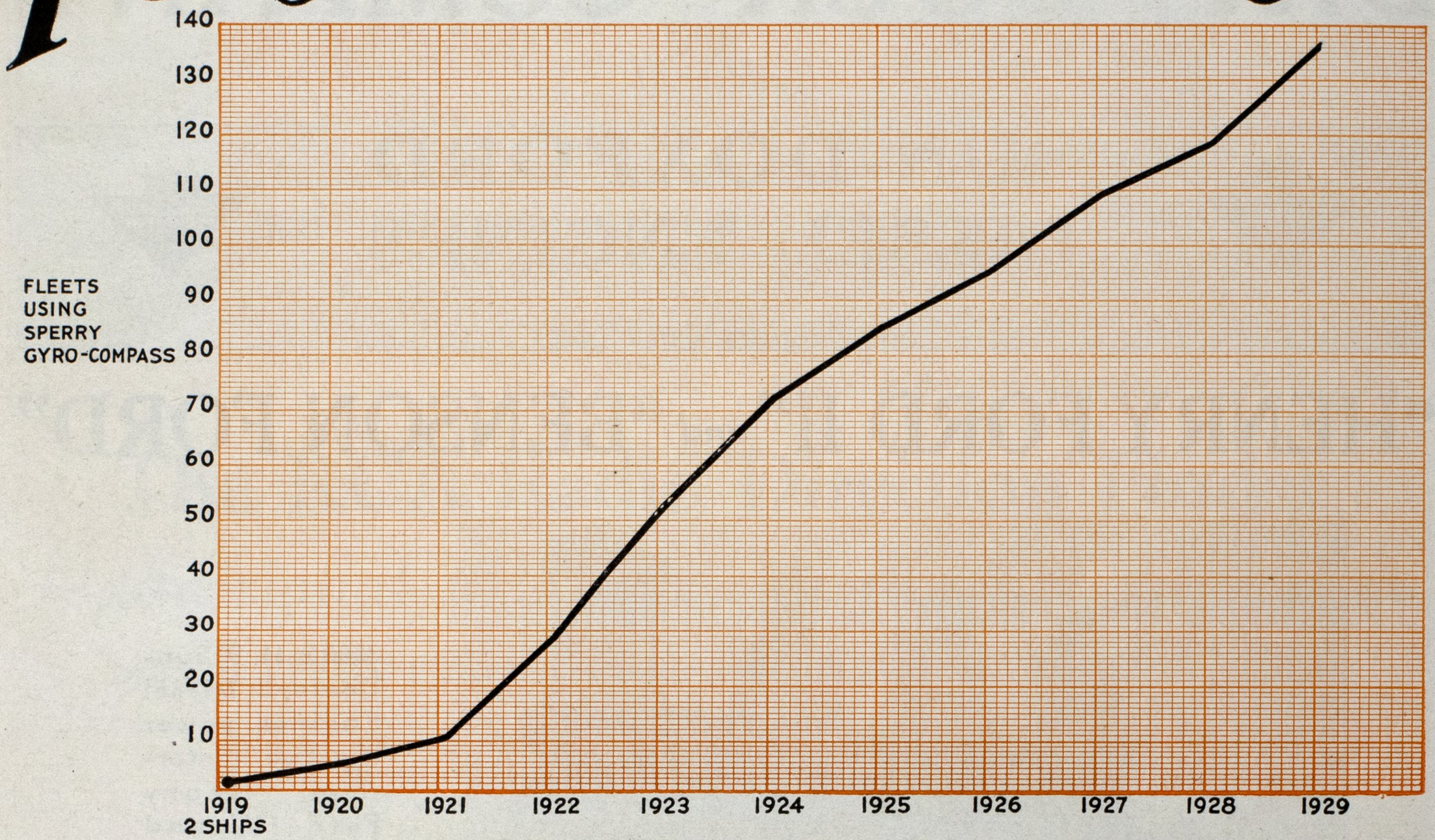
BETHLEHEM SHIPBUILDING CORPORATION, LTD.
BETHLEHEM, PA.

General Sales Offices:

Atlantic Coast: New York Pacific Coast: San Francisco
District Offices: Boston, Baltimore and San Pedro

BETHLEHEM

10 years this July



GRAPH SHOWING THE RAPID ADOPTION OF THE SPERRY GYRO-COMPASS IN THE WORLD'S MERCHANT MARINE DURING THE PAST 10 YEARS

In 1919
two Merchant SHIPS were fitted with the SPERRY GYRO-COMPASS

In 1929
more than 130 Merchant FLEETS will navigate over 50,000,000 miles with the aid of SPERRY GYRO-COMPASSES

TEN years ago this July, the S. S. "BERGENSFJORD" of the Norwegian American Line moved out of her slip in New York, starting a voyage that is now history. During her stay in port, the "BERGENSFJORD" had been fitted with a Sperry Gyro-Compass, the first to be permanently installed on a merchant ship.

¶ In the years which have followed this modest beginning the Sperry Gyro-Compass has become standard equipment on the merchant vessels of almost every nation. Starting with ocean liners its use rapidly extended to practically all classes of vessels including Freighters, Bulk Carriers of the Great Lakes, Colliers, Transports, Cable Ships, Tankers, Yachts, Car Ferries, Dredges and Tow Boats.

¶ We now begin a second decade with renewed determination to continue expanding the usefulness of the Gyro-Compass, Gyro-Pilot and other Sperry equipment used in the World's Merchant Marine.

SPERRY GYROSCOPE CO., INC.

BROOKLYN
CLEVELAND PHILADELPHIA SEATTLE

SPERRY

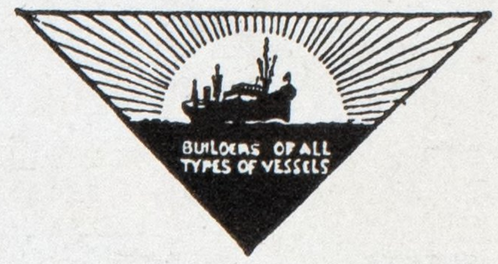
NEW YORK
LOS ANGELES SAN FRANCISCO

SUN SHIPBUILDING & DRY DOCK COMPANY

Builders of

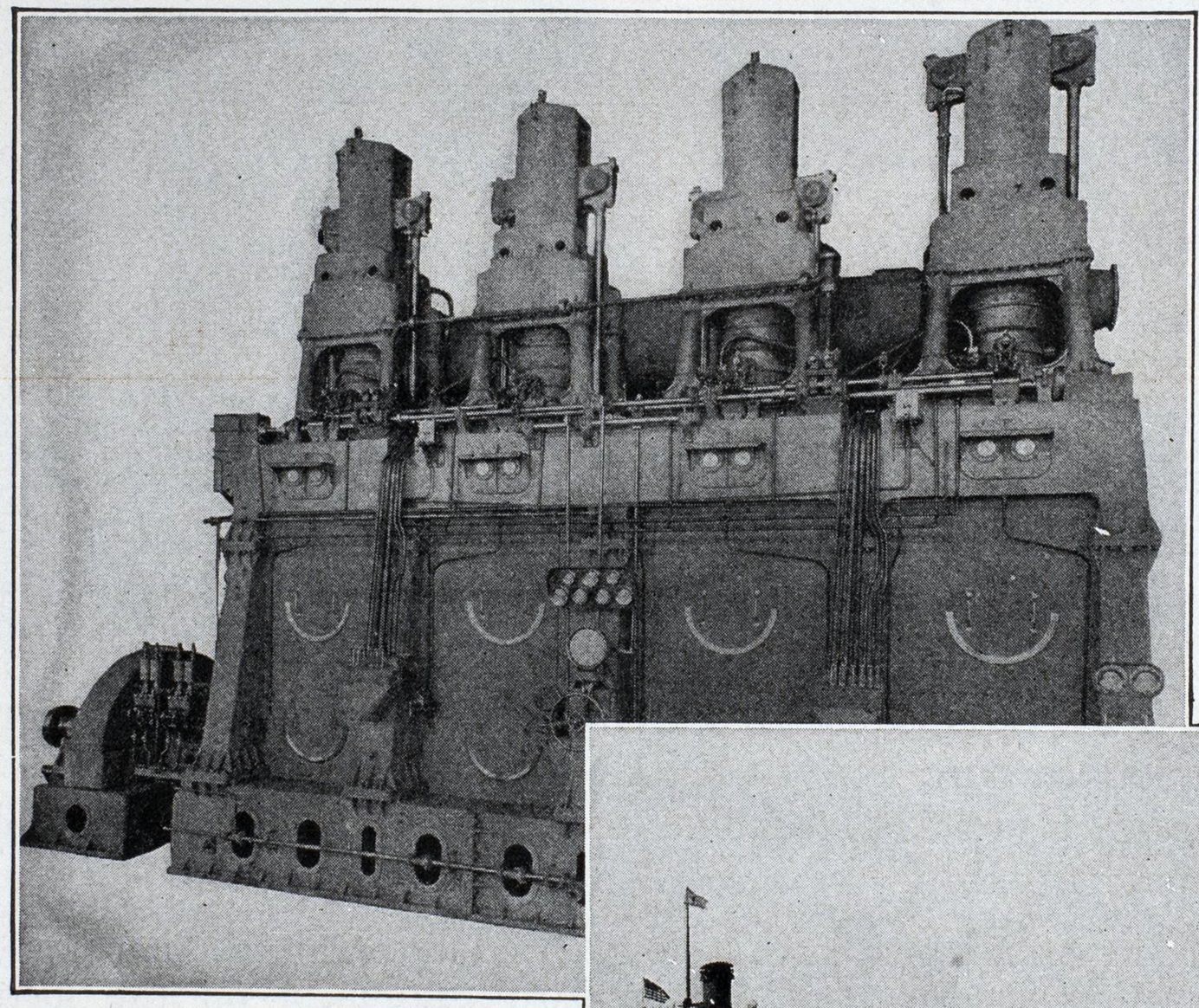


SUN-DOXFORD DIESEL ENGINES



The Engines that Power

"HENRY FORD II" *and* "BENSON FORD"



3000 S. H. P. Sun-Doxford Diesel Engines power the two motorships, "Henry Ford II" and "Benson Ford".



M. S. "Henry Ford II"

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Philadelphia Office:
Finance Building

New York Office:
Cunard Building



S.S. Yarmouth, Eastern S.S. Lines complete radio equipment by RCA

The RCA Radio Direction Finder

—additional protection of the S.S. Yarmouth

MORE THAN 1300 VESSELS ARE NOW SERVICED BY RCA

American shipping officials recognize that the service of the Radiomarine Corporation of America is unsurpassed for efficiency of detail and unequalled for diversification, completeness and all-around excellence.

That is the reason why the great majority of all radio equipped vessels sailing under the American flag are serviced by the Radiomarine Corporation of America.

Complete RCA service does not stop with supplying complete radio transmitting and receiving equipment of the vacuum tube type and radio direction finder equipment; nor with regularly inspecting and servicing it. The scope of the service embraces the detailing of competent operator personnel, the maintenance of coastal radio stations on the Atlantic, Pacific, Gulf and Lakes for clearing radio traffic, checking and settling accounts, and the procuring of government license to operate.

Is there any wonder why the American Merchant Marine turns to RCA service?

Radiomarine coastal stations are located at the following points.

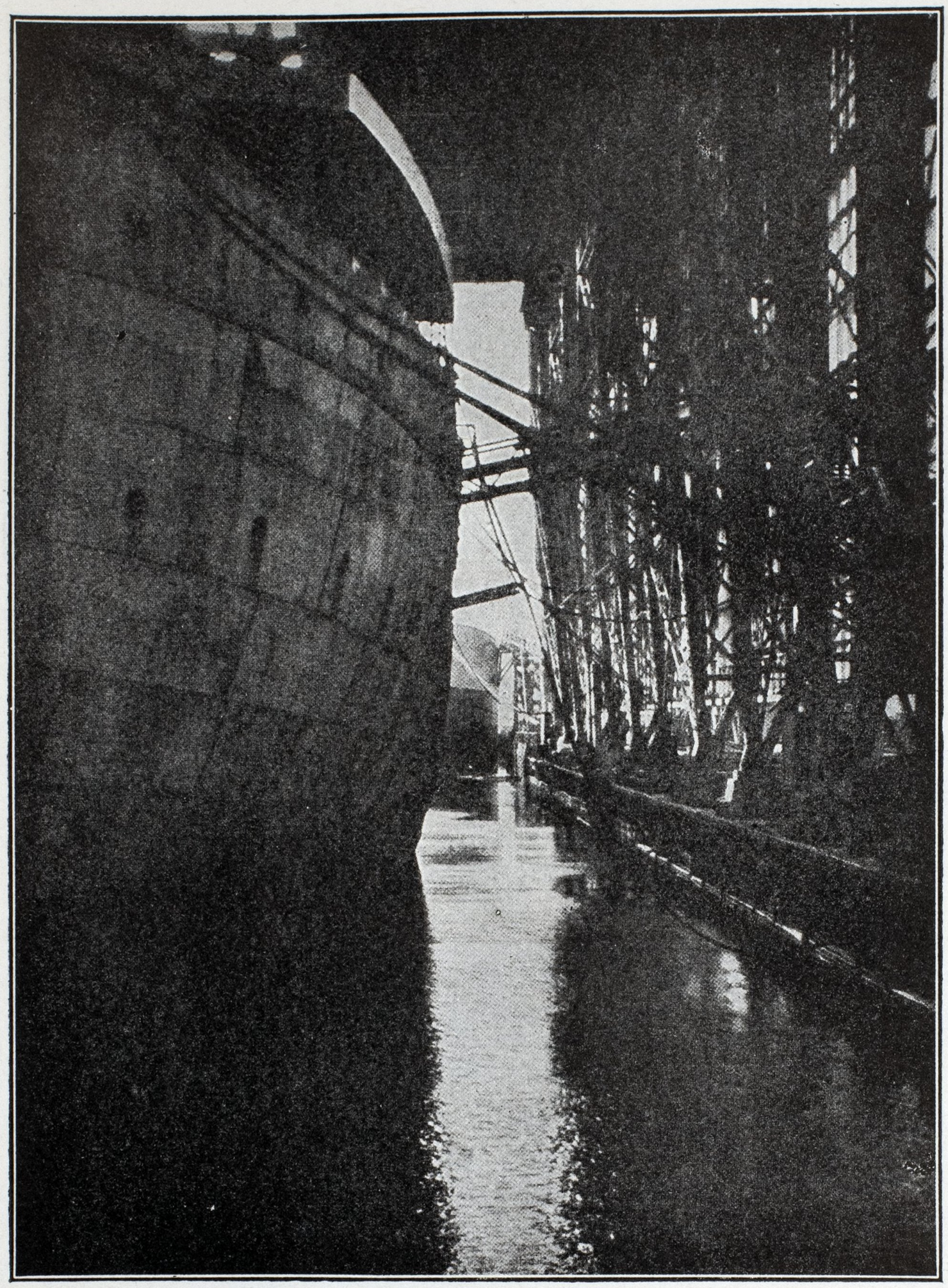
Chatham, Mass.
New London, Conn.
East Moriches, L. I.
New York, N. Y.
Tuckerton, N. J.
Baltimore, Md.
(City station)
Galveston, Tex.
Los Angeles, Cal.
San Francisco, Cal.
Chicago, Ill.
Cleveland, Ohio
Buffalo, N. Y.
Duluth, Minn.

RCA clients receive the full benefits of the service depots of the associated companies maintained at principal ports throughout the world.

Radiomarine storerooms and service stations in charge of radio men of long experience are located at the following ports:

Boston
Providence
New York
Philadelphia
Baltimore
Norfolk
New Orleans
Port Arthur
Galveston
Los Angeles
San Francisco
Seattle
Honolulu
Cleveland
Chicago
Buffalo
Duluth

RADIOMARINE CORPORATION
OF AMERICA
66 BROAD STREET
NEW YORK



New York Shipbuilding Company has constructed vessels for the following private corporations:

American Dredging Co.
American-Hawaiian Steamship Co.
Atlantic & Caribbean Steam Navigation Co.
Atlantic, Gulf & Pacific Company
Atlantic Transport Company
Baltimore & Ohio Railroad
Brooklyn Eastern District Terminal Company
Carpenter O'Brien Company
Chesapeake & Ohio Railway Co.
Coastwise Transportation Company
Consolidated Coal Company
Darrow & Mann Company
Delaware, Lackawanna & Western R. R. Co.
East Coast Transportation Company
Electric Ferries, Incorporated
Empire Engineering Corporation
Great Lakes Dredge & Dock Co.
J. M. Guffey Petroleum Company
Gulf Refining Company
W. R. Grace & Company
Hudson Navigation Company
Hudson River Day Line
International Cement Corporation
Lehigh Valley Railroad Company
Long Island Railroad Company
Merchants & Miners Transportation Co.
Morgan's Louisiana & Texas R. R. & S. S. Co.
Munson Steamship Company
New York Central Lines
New York Engineering Company
New York, New Haven & Hartford Railroad
New York, Philadelphia & Norfolk R. R.
Old Dominion Steamship Company
Pacific Coast Steamship Company
Pacific Mail Steamship Company
Pennsylvania System
R. A. Perry Company
Petroleum Transportation Co.
Pocahontas Navigation Company
Reading Company
Rockland Transportation Co.
Southern Pacific Company
Standard Oil Company of New Jersey
Standard Transportation Company
Texas Oil Company
Tide Water Oil Company
United Dredging Company
United Fruit Steamship Company
Venezuela Gulf Oil Company

COMPLETENESS

TO BUILD any type of vessel and to outfit it complete in every detail—that, in short, has always been the principle and purpose of the New York Shipbuilding Company.

Complete shop facilities and a complete staff of trained specialists have built for this yard the enviable name in marine circles that it now occupies.

In line with this policy, the New York Shipbuilding Company has produced a large percentage of the propulsion machinery going into the ships constructed here including turbine, reciprocating, Diesel, and electric units.

We offer economy and undivided responsibility to all who place with us the responsibility of ship design and construction.

We solicit the opportunity to bid on your requirements.

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Camden New Jersey



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5946-54 Cass Avenue

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Every *Trawler* needs this Battery

Successful fishing-boat owners and captains quickly see the advantage of high-powered dependable lighting when the men are at the nets.

But with engines idle, floodlights drag a lot of juice off the line. Only a sturdy high-capacity battery can stand the strain, night after night.

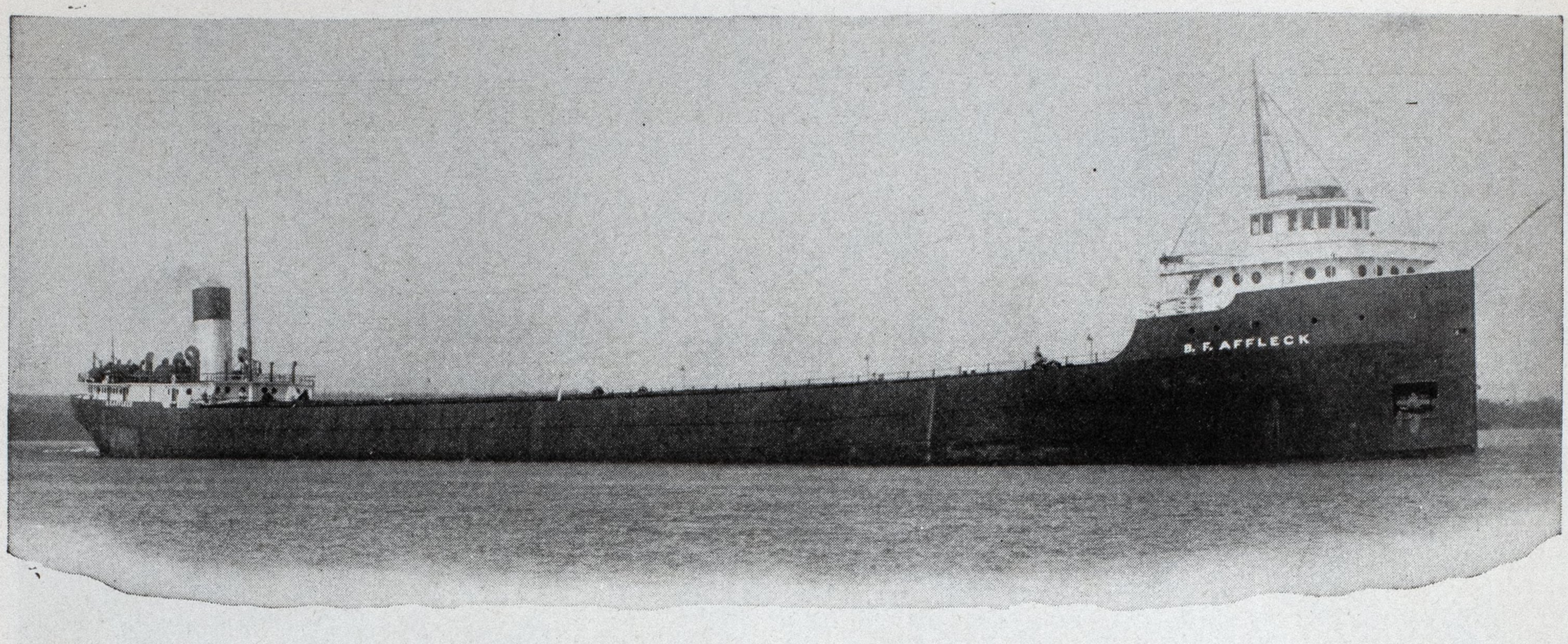
The Willard 56-60 cell KTWS is the battery for this job. Specially designed for endurance, it is a *fast seller* because it fits in with the *daily needs* of the whole trawler fleet.

Write your nearest distributor for details of the opportunity in your port. Every fishing boat is a good replacement prospect.



Willard Storage Batteries are the result of over twenty-five years of battery manufacture. Lead, lead compounds, battery solution and all materials are thoroughly tested before going into the battery, and each battery is rigidly inspected before leaving the factory.

Willard MARINE BATTERIES



B. F. AFFLECK

Finest Type of Great Lakes Cargo Carrier

S.S. B. F. Affleck owned and operated by the Pittsburgh Steamship Company, is a single deck bulk cargo vessel of the standard type built for the iron ore, coal and stone trade of the Great Lakes. Her molded dimensions are: Length overall, 604 feet, length between perpendiculars, 580 feet; width 60 feet and depth 32 feet. Capacity 12,000 tons.

A diversified experience, covering the construction of all types of ships, fully qualifies us to meet *your* requirements thoroughly and with despatch.

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Car Ferry, ANN ARBOR No. 5
Twin Screw Excursion Steamer, THOUSAND ISLANDER
Self Unloading, JOHN W. BOARDMAN

Toledo
Shipbuilding Company, Inc.
Toledo, Ohio

KILL FIRE WHILE IT IS YOUNG



FOAMITE Protection — for Engine and Boiler Rooms

For freighters—for tankers—for passenger ships—for any ship afloat—the FOAMITE Generator System provides ideal protection against engine and boiler room fires.

Firefoam, smothering fire under an air-tight blanket of foam, is produced by the automatic mixture of a single powder and water (either salt or fresh). The quantity of *Firefoam* is limited only by the supply of powder. *Firefoam* puts the toughest fire out and keeps it out. It is just as effective on fires in blazing oil or inflammable liquid, as it is on fires in any other type of material.

The FOAMITE Generator is mobile. It can cover fires in the engine and boiler room through fixed piping. With the aid of hose it can cover almost any other point on the ship. With certain protection it combines minimum weight and space requirements, low initial cost and practically no maintenance.

Ask for a demonstration of the FOAMITE Foam Generator. American-La France and Foamite Corporation, Engineers and Manufacturers, Dept. J 17 Elmira, N.Y.



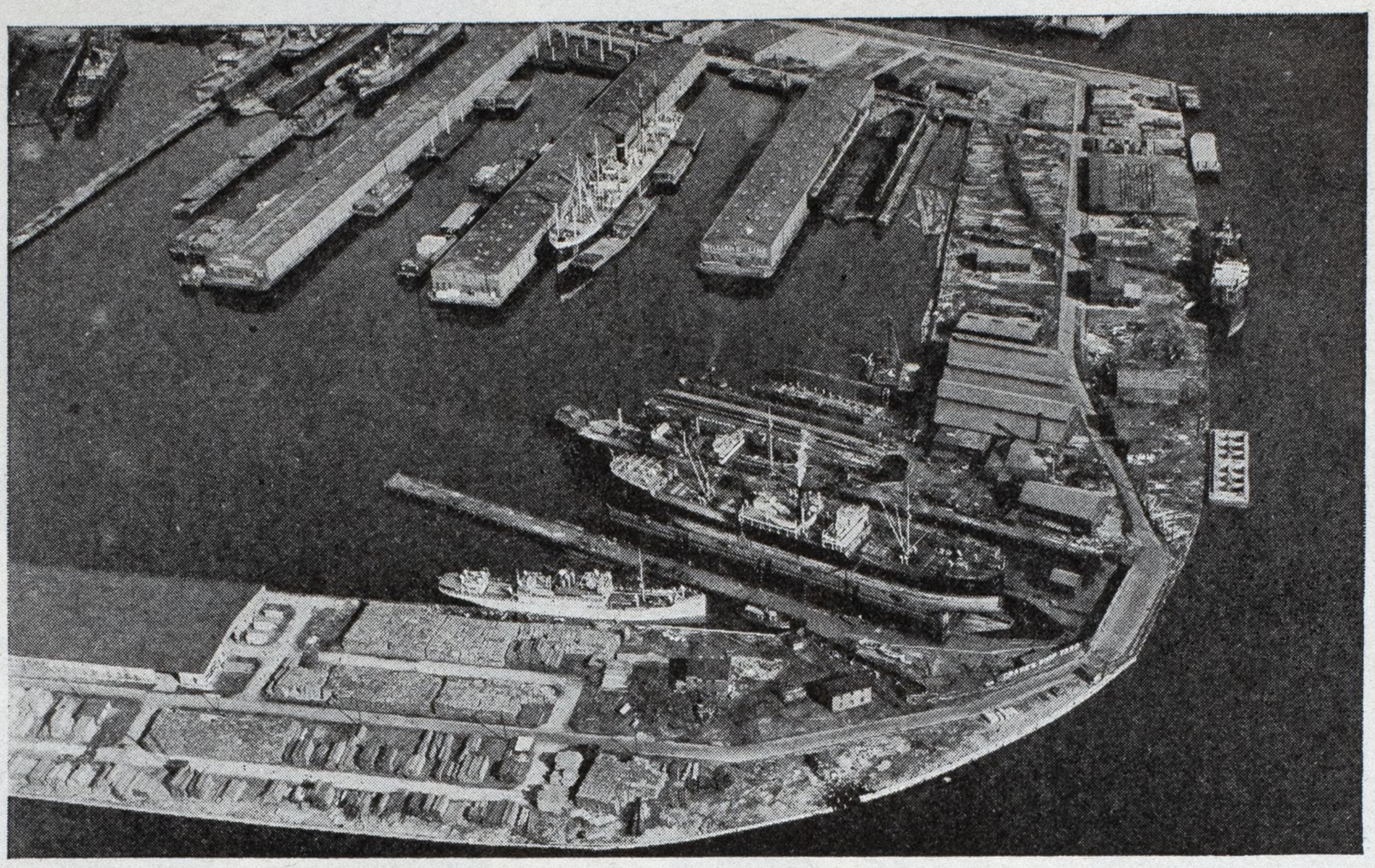
"Needless Ruin" describes the FOAMITE *Generator System and illustrates typical layouts. It also covers* ALFITE *protection for cargo holds. Write for your copy.*

AMERICAN-LA FRANCE AND FOAMITE PROTECTION

A Complete Engineering Service

For Extinguishing Fires

MARINE REPAIRS



The CRANE Plant of United Dry Docks, Inc.

With six large repair yards and 27 dry docks in New York Harbor, this company is prepared to render efficient and economical service. Its plants are those formerly operated by

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Staten Island Shipbuilding Company
W. & A. Fletcher Company
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New York Harbor Dry Dock Co., Inc.

(New York Harbor plant reserved for dry docking and cleaning of oil tankers.)

Clients who prefer to deal with the particular plant to which they have become accustomed will find the same able personnel at their service.

Drydocking
Repairing
Reconditioning

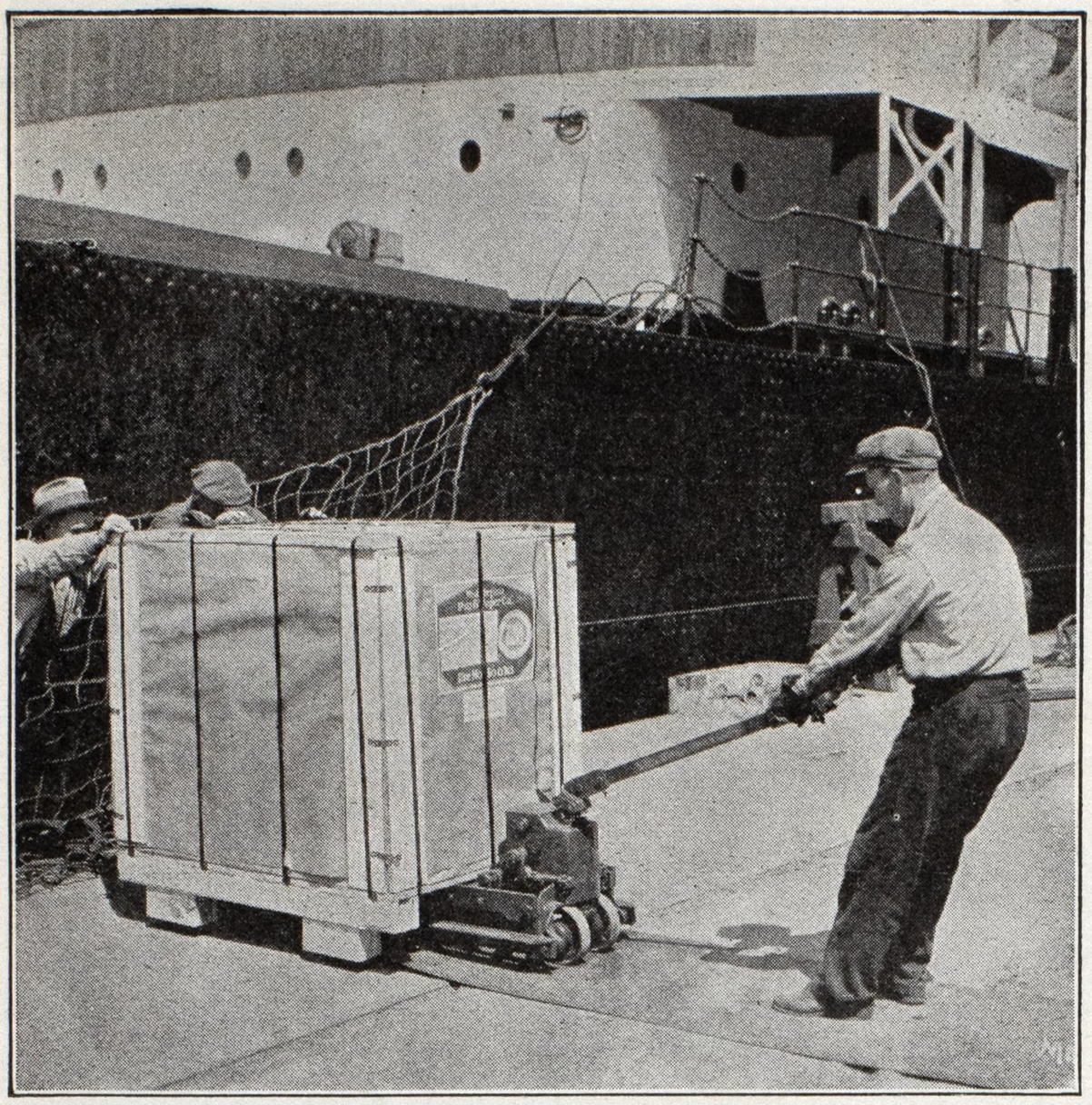
Shipbuilding — Ferry boats, tugs, yachts, barges, etc. Diesel engine repairs, under expert supervision. Designing and building of marine engines and boilers.

Prompt Efficient Service

UNITED DRY DOCKS

INCORPORATED

11 Broadway **New York**



A typical dock scene showing the quick unloading of Skid Platform loads of paper. These loads traveled on Skid Platforms from New York to San Francisco by Steamer.

LEEDS, TOZZER & CO., INC. — AGENTS — LT&Co INC. — 75 WEST ST., NEW YORK

CUT HANDLING COST AT DOCK

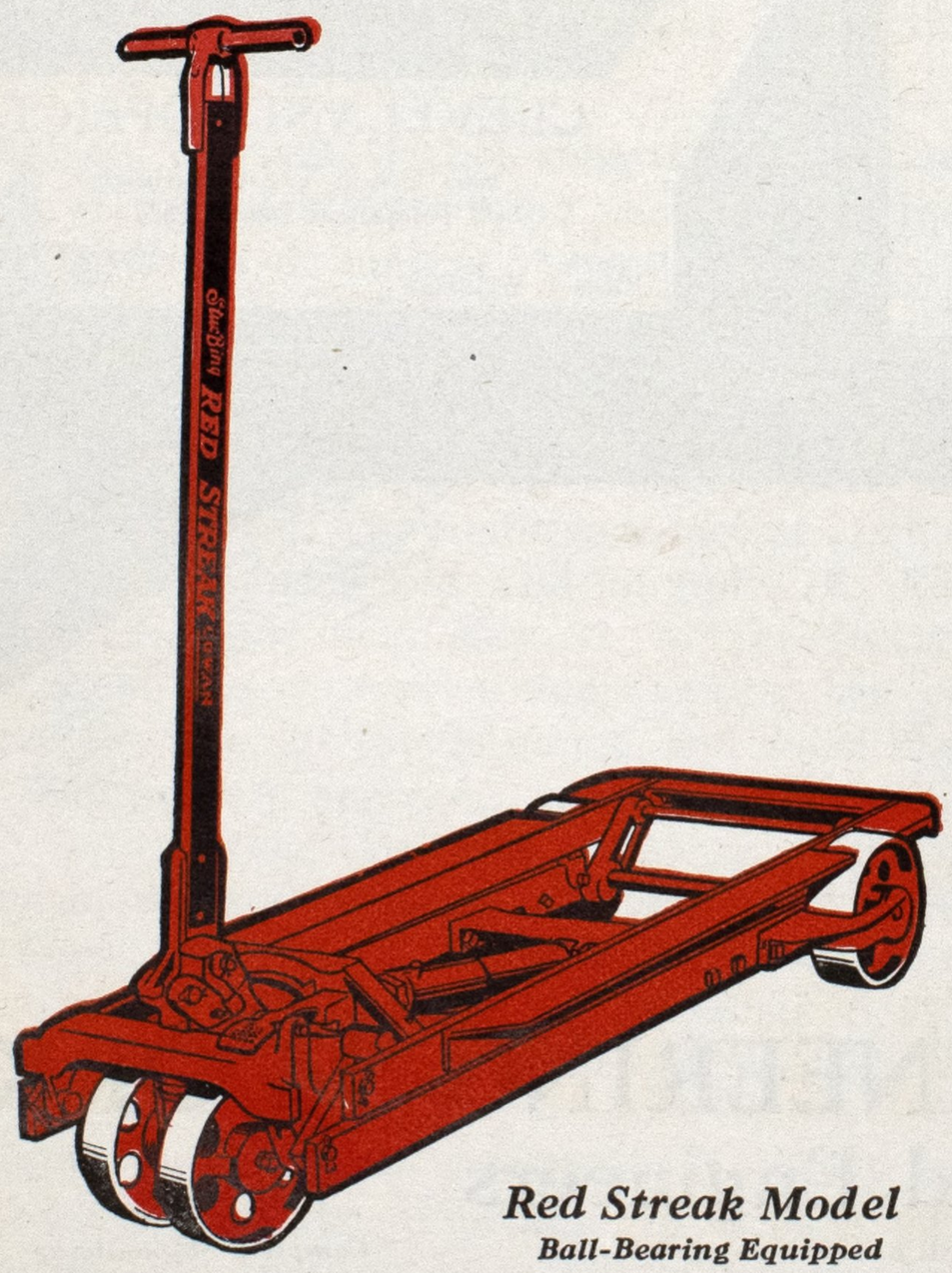
Savings in handling cost ranging all the way from 60% to 90% are regularly reported by the Steamship Companies using Stuebing Cowan Lift Trucks and Skid Platforms for freight handling at their docks.

Stuebing Cowan Lift Trucks and Skid Platforms not only speed up loading and unloading but provide a safe and inexpensive means of handling heavy or bulky loads. Stuebing Cowan Lift Trucks and Skid Platforms are the choice of such large companies as the Eastern Steamship Company, the Munson-McCormick Line, the New York Central and others.

Stuebing Cowan challenges the world to find a better Lift Truck. Such advantages as easiest lift—easy pull—speed—safety—low maintenance—are found only in Stuebing Cowan Lift Trucks. They are guaranteed regardless of the number of years in use.

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Arrange for a demonstration at your dock or terminal, or, if you prefer, our representative will gladly call upon you to help solve your material handling problems. No obligation. Do not hesitate to call upon us. Write us at once.



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Ball-Bearing Equipped

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M. W. LACY, Assistant to Plant Manager
326 Chestnut St., Wyandotte, Mich...Wyandotte 374-W

FRANK M. SCOTTEN, Mechanical Engineer
227 Military Rd., Dearborn, Mich.....Dearborn 447

GEORGE CAIN, General Yard Supt.
71 Elm St., River Rouge, Mich.....Cedar 4290-J

JOHN GREIG, Docking Foreman.
110 Walnut St., River Rouge, Mich.....Cedar 5558-W

FRED ERNST, Supt. Machine Shops
6230 Fort St., W., Detroit, Mich .....Cedar 0106

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112 Walnut St., River Rouge, Mich.....Cedar 5245-W

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ROY MCDOWELL, Chief Clerk
122 Moy Ave., Windsor, Ont.....Burnside 1837-W

R. PEET, Solicitor
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O. WOERFUL, Plant Supt.
2971 Seyburn Ave., Detroit, Mich.....Lincoln 3943-J

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M. H. PILKINGTON, Chief Clerk
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Shipbuilders and Engineers

Engine Works Equipped For General Heavy Machine and Foundry Work

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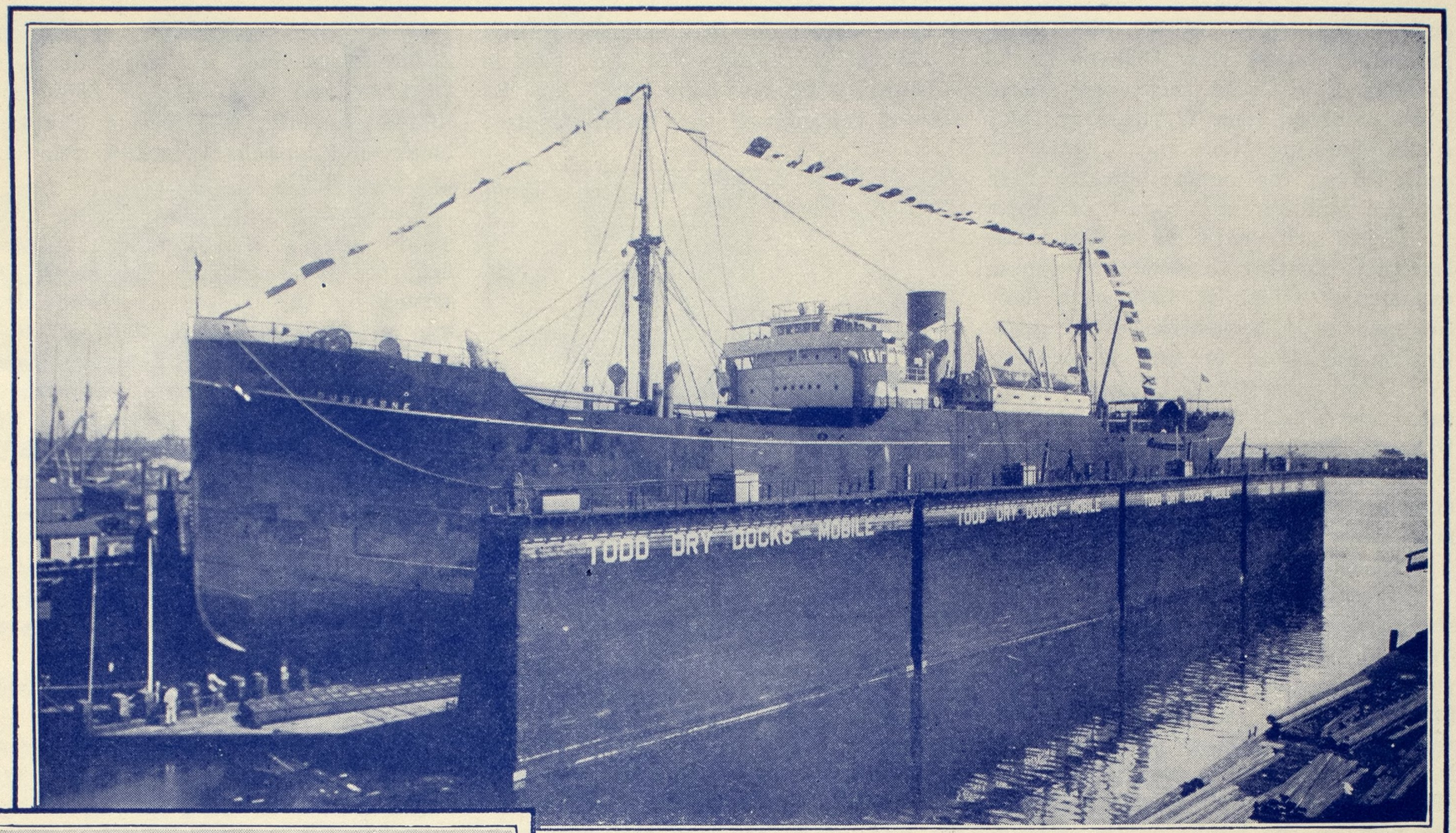
GENERAL OFFICES

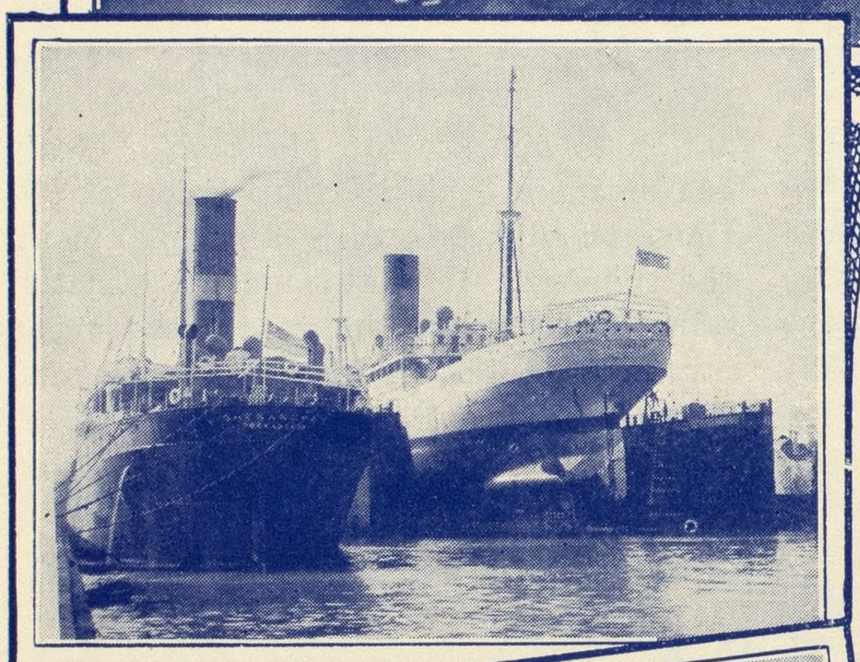
River Rouge, Michigan

Cleveland Office: Union Trust Bldg.

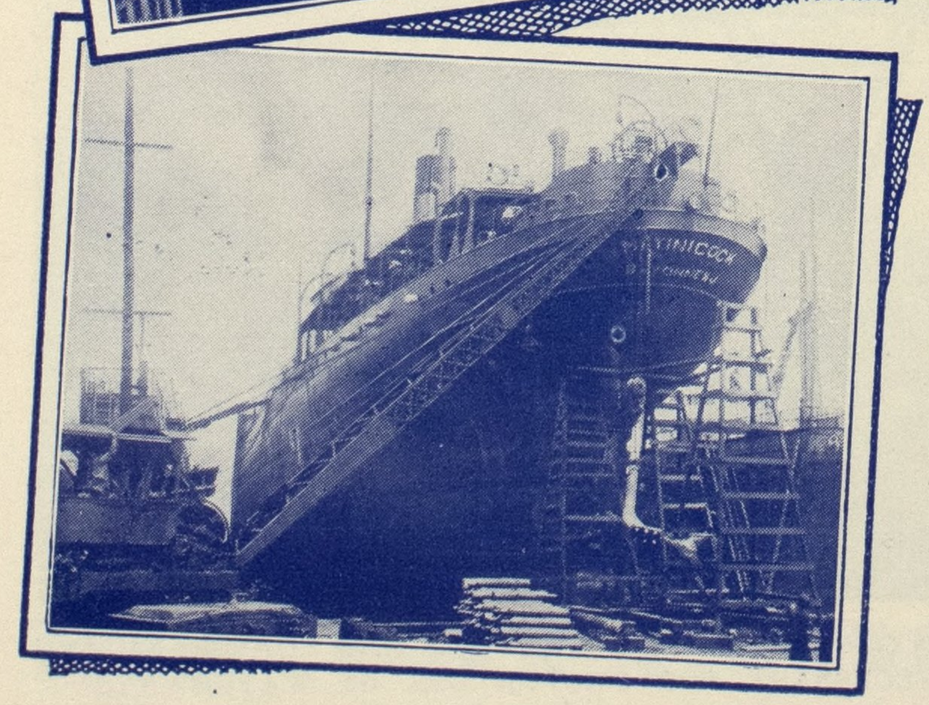
Complete Shipbuilding Dry Dock and Repair Facilities

River Rouge, Mich., and Ashtabula, Ohio









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To keep abreast of Mobile's steady growth in importance as a Gulf Port, this company is extending the facilities of its subsidiary, the Todd Shipbuilding and Dry Dock Company, Inc., to provide berthing for six additional large ships, or a greater number of large and small vessels.

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Tietjen & Lang Dry Dock Co. *Hoboken, N. J.*

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TODD NEW YORK, U.S.A.

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Cable Address: Robin, New York

PLANTS

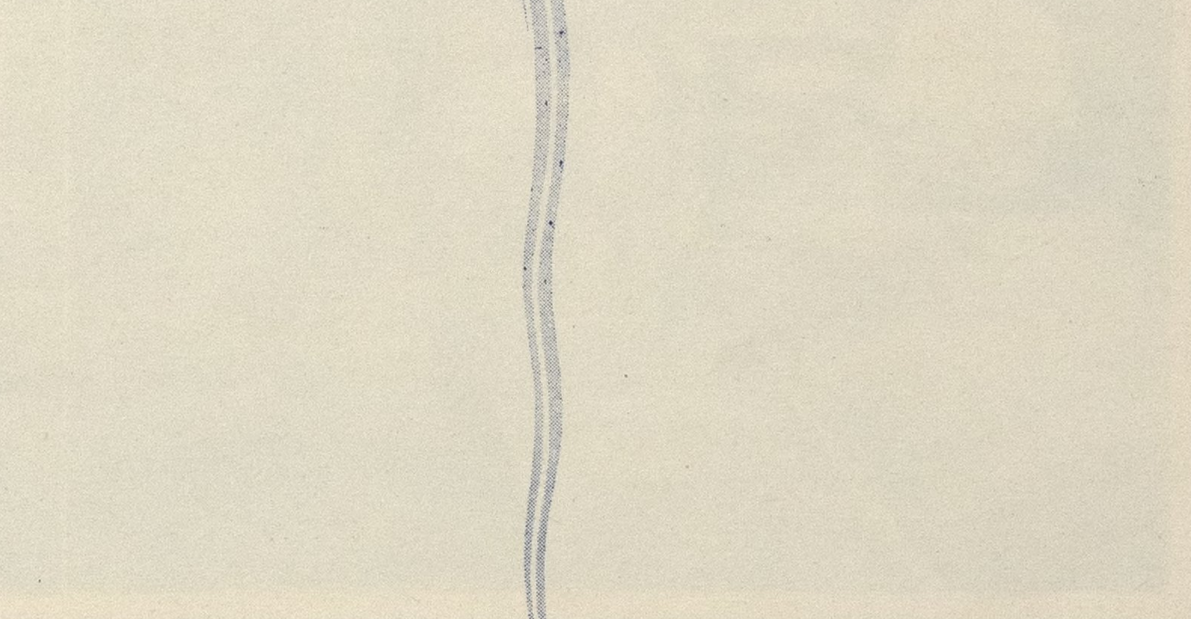
Todd Engineering Dry Dock & Repair Co.
New Orleans, La.

Todd Dry Dock Engineering & Repair Corp.
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Todd Dry Docks, Inc.
Harbor Island, Seattle, Wash.

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Oil Burning COEN Equipment

Gulf Coast Service!

A complete stock of parts for
Coen Oil Burning Equipment
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BEN BLUM & CO.

Mobile
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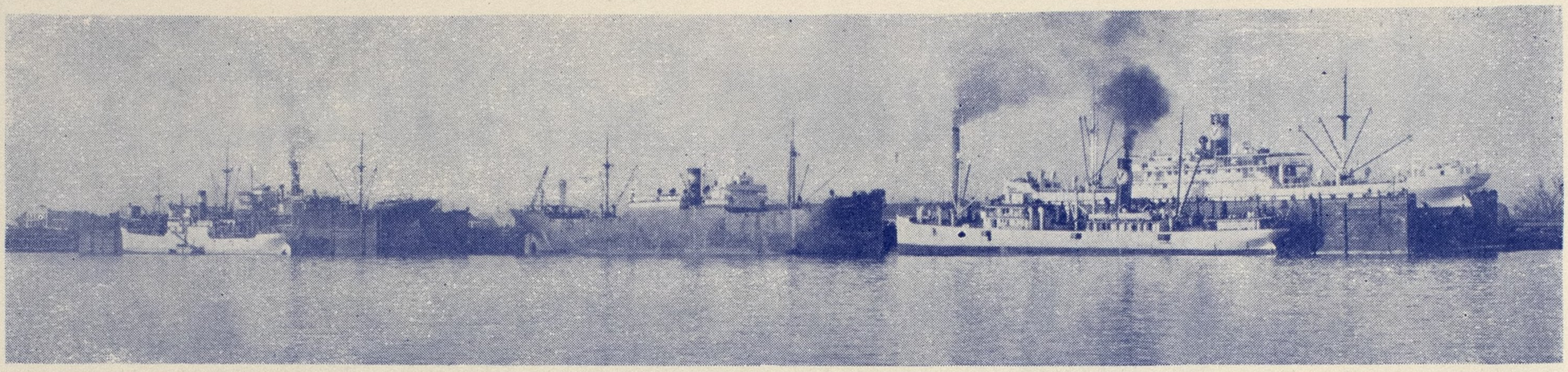
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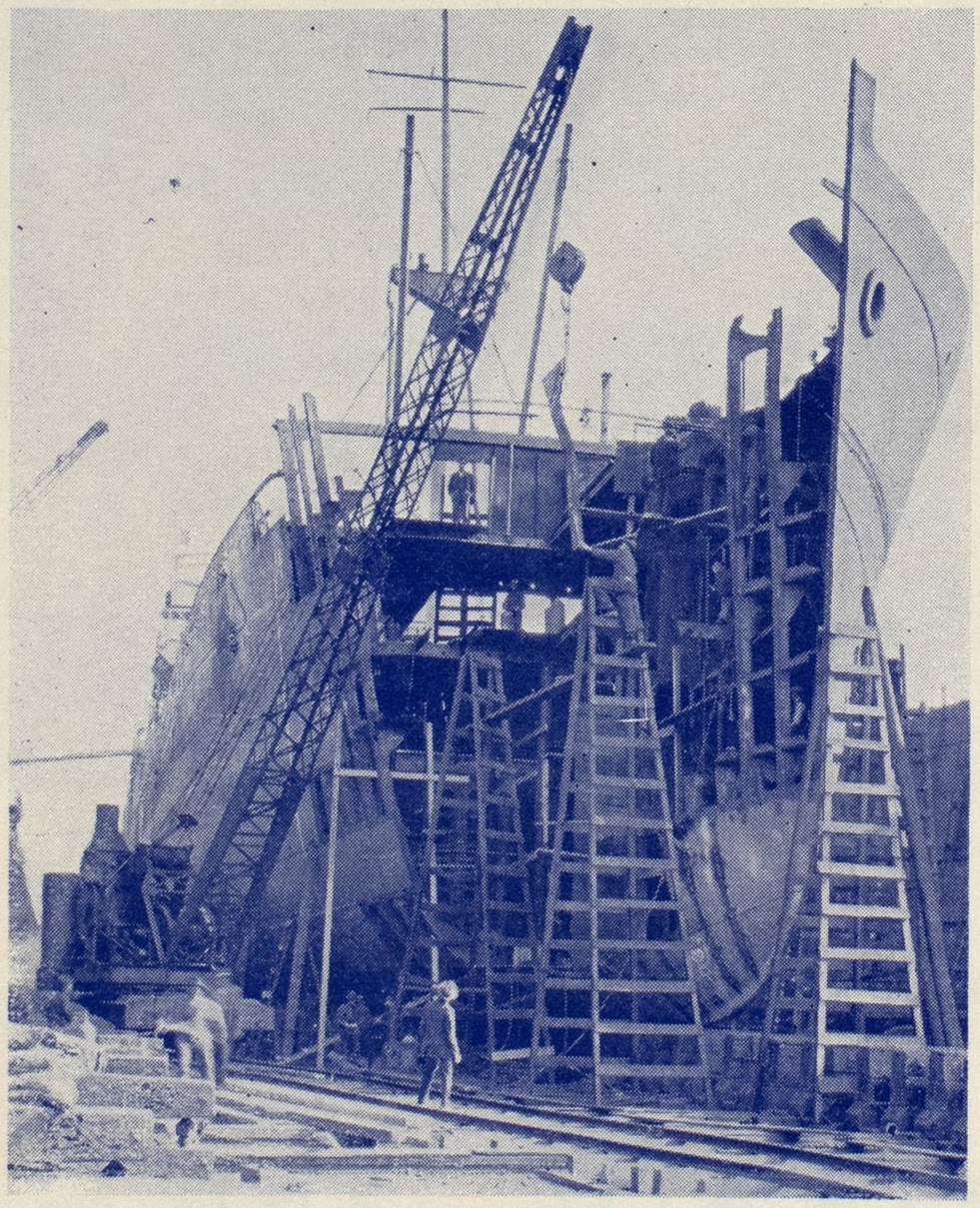
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Service for Ships
Year in and year out



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Jahncke Dry Docks, Inc.
New Orleans, U. S. A.



French S/S MONT ACEL Undergoing Collision Repairs, Jahncke Plant

TWO Dry Docks 1—10000 Ton and 1—8000 Ton Lifting Capacity. ¶The largest Ship Repair Plant in the Gulf equipped with all modern machinery for expeditious work.

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Heavy Forgings
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Electricians
Plumbers
Electric and
Acetylene Welding

THE largest plant on the Gulf of Mexico equipped to make complete repairs in all lines to Steel and Wood Vessels.

SPECIALISTS
IN ALL TYPES OF STEEL BARGE CONSTRUCTION

Shipbuilding

Steel — — Wood

Ship Repairs

All Classes

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Shipbuilders and Ship Repairers

Three Large Graving Docks

Steel, Brass and Iron Foundries

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Of Every Description

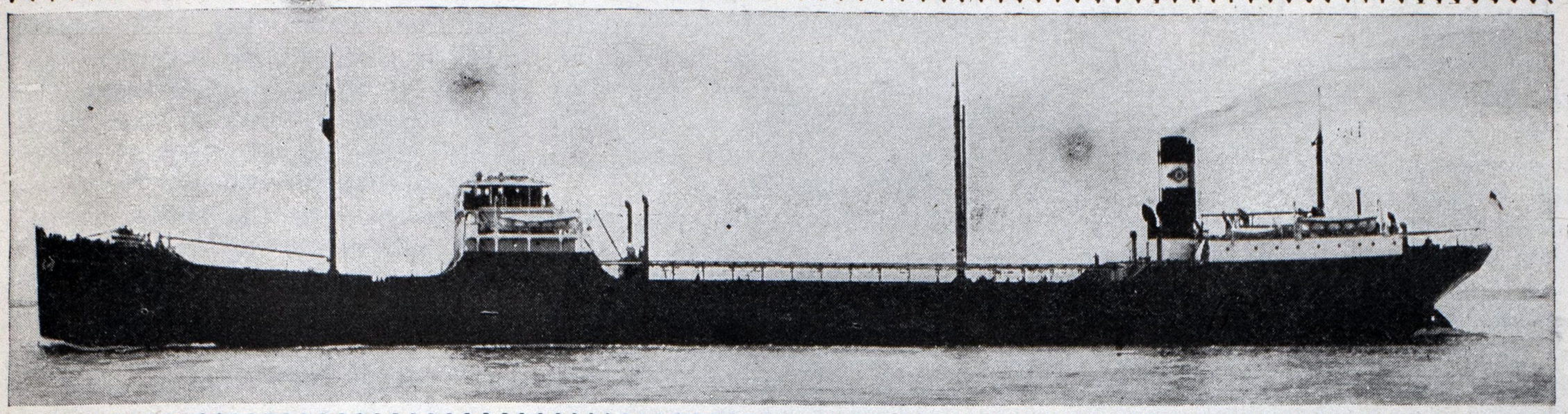
Newport News Composition Anti-Corrosive and Anti-Fouling

Plant Located at

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On Hampton Roads

233 Broadway, New York



Another Unit of the great fleet

The Motor Ship "Herman Falk," a tank ship of 10,200 d.w.t. is owned and operated by the Oil Transport Company of Baltimore and is another fine example of the many Texaco lubricated motor vessels now plying the waters of the globe.

The outstanding success of Texaco Ursa Oil for Diesel lubrication and its availability at the principle ports everywhere have placed this lubricant aboard an increasing number of the world's motor vessels.

The "Herman Falk" is equipped with two 4-cycle, 8-cylinder Diesel engines of 1425 S.H.P. at 275 R.P.M. with Falk Reduction Gear drives to 90 R.P.M. at the propellers.

These engines are Texaco lubricated.

Texaco Ursa Oil is used in the *Cylinders*
Texaco Ursa Oil is used in the *Crankcases*
Texaco Ursa Oil is used in the *Compressors*

Texaco Ursa Oil, clean, clear, golden, is scientifically refined to meet the most exacting Diesel requirement. It has precisely the qualities for effective Diesel engine lubrication under all conditions and a low carbon residue that is remarkable.

TEXACO LUBRICANTS

THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS
MARINE SALES DIVISION
17 Battery Place, New York City

THERE IS A TEXACO LUBRICANT FOR EVERY PURPOSE

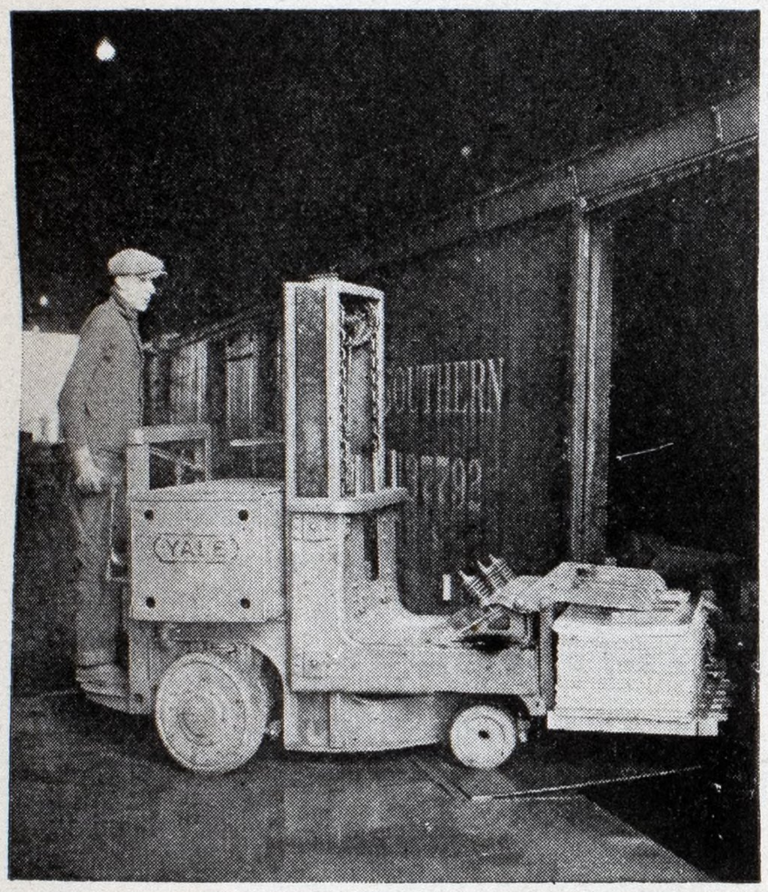


SPEEDY UNLOADING.—*An electric industrial truck that goes right into the freight car to take off material.*

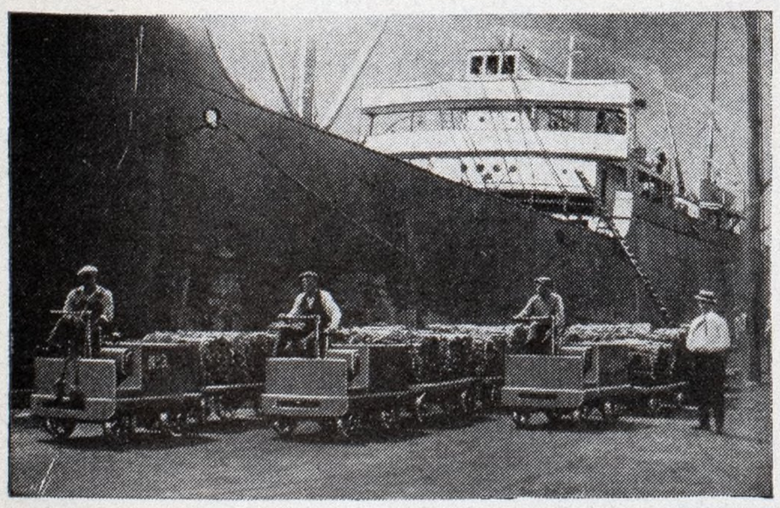
REDUCE

Receiving Platform Costs

Hundreds of plants do it with industrial electrics that move more material faster



ANY USE.—*Electric industrial trucks are constantly being developed to fill special needs and save handling costs.*



QUICK WORK OF A SHIPLOAD.—*A fleet of electric industrial tractors makes rapid work of material handling on this receiving pier.*

START saving money with the unloading. Hundreds of firms are cutting the cost per ton of material by moving it from cars and ships to warehouse and process with electric industrial trucks and tractors.

By keeping material moving steadily from the receiving platform, unloading is swiftly and smoothly performed. Demurrage through delays is avoided. Man hours and cost per ton of material handled are greatly reduced.

A tannery in Chicago, Ill., reports an annual saving of $3500 a year through replacing hand labor with electric trucks. In a grocery warehouse at Brooklyn, N. Y., one small industrial electric truck does in 8 hours the same work it would take the regular personnel three days to do.

These instances are not unusual. You may easily be able to better them yourself. It's worth while studying the problem.

When you do, consider the Exide-Ironclad Battery that is built expressly for hard electric industrial truck service. This battery gives a consistently high voltage for good day-long speed. Its power is tremendous, flowing steadily for usual work or in a sudden rush for extra-heavy loads.

The Exide-Ironclad is economical at the charging panel, and its unique positive plate construction results in a greatly increased battery life. And it is backed by the forty-one years' experience of the world's largest manufacturers of storage batteries for every purpose.

Send for Bulletin 160-R. It gives you some interesting information about the many uses of electric industrial trucks and tractors and the savings you can effect with them.

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

USE ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS

THE DUSKY STEVEDORE ON WHEELS



Cutting Labor Costs One Fifth For Binyon Shipside Warehouse Co.

The modern pace is felt in the sunny Southland, as evidenced by the Binyon Company's satisfaction with their "Clarkat" and a train of 20 Clark rubber tired Steel Trailers.

They write:

"The up-keep has been practically negligible on both the 'Clarkat' and Trailers.

"We have found this unit most satisfactory, both in the warehouse and in receiving cargo from ships, in that with its use our labor costs have been cut from 15 per cent to 25 per cent.

"We do not hesitate to say that we would not be without this equipment in Stevedoring operations."

W. J. Binyon, Jr.

It is to be hoped you can write similarly some day of your savings. Send the coupon for descriptive bulletin.

Clark Tructractor Co., Battle Creek, Mich.

CLARK TRUCTRACTORS

Reg. U. S. Pat. Office

Send This Coupon

Clark Tructractor Co.

Please send information on

[ ] "Clarkat" Tructractor
[ ] Clark Steel Trailers

Name .....

Company .....

Address .....

MR-7-29



Inside on Costs on Handling Cargo

Within this book are twenty reports such as above.

Goodrich Transit Company tell how an $80,000 saving in one year in handling cargo was made—an amount almost equivalent to the initial cost of the system.

Bush Terminal tell how twelve tractors serve over 3000 trailers at reduced costs over the usual methods used that are slow and wasting of labor.

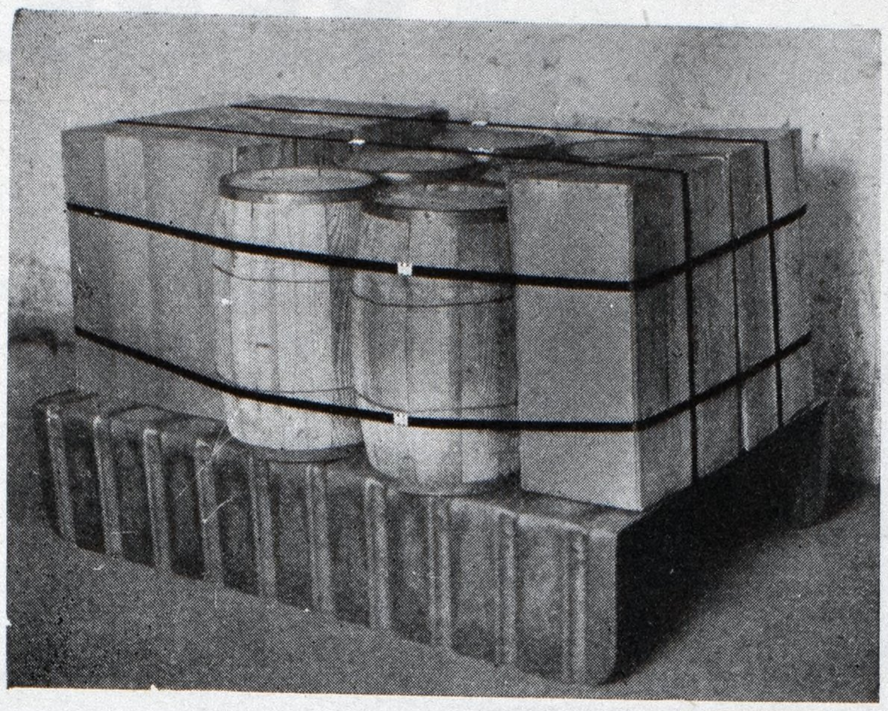
Eastern Steamship Lines Inc., tell why after exhaustive investigation they decided on the use of tractors and trailers.

Fact is, this book gives you the inside facts on savings in cargo and freight handling written by the officials of docks and terminals themselves in a way that shows its adaptability and value that is clear, concise, believable.

You should have a copy for ready reference. Write for yours today—now and see how simple it would be to change a high cost operation into a means of increased profits through savings.

Mercury Manufacturing Co.
4160 So. Halsted Street
Chicago, Illinois
Canadian Representatives: Laurie Machinery Co., Ltd., Insurance Exchange Bldg., Montreal, Canada

Mercury
Trackless Train



Unit of railway supplies strapped to pressed steel platform

Recommend ACME *Nailless* Band for Securing Loads on Skids

There is a big saving of time and cost in handling shipments when various units of the load are securely fastened on skids.

Skid-shipping benefits not only the carrier but also the shipper and the receiver of goods because of greater safety and dispatch in forwarding.

And the best way to fasten a load to any type of skid—metal or wooden—is to use Acme Nailless Steel Band, tightened and sealed with specially designed Acme tools.

Acme Nailless Band has a tensile strength of 42 tons to the square inch. It holds!

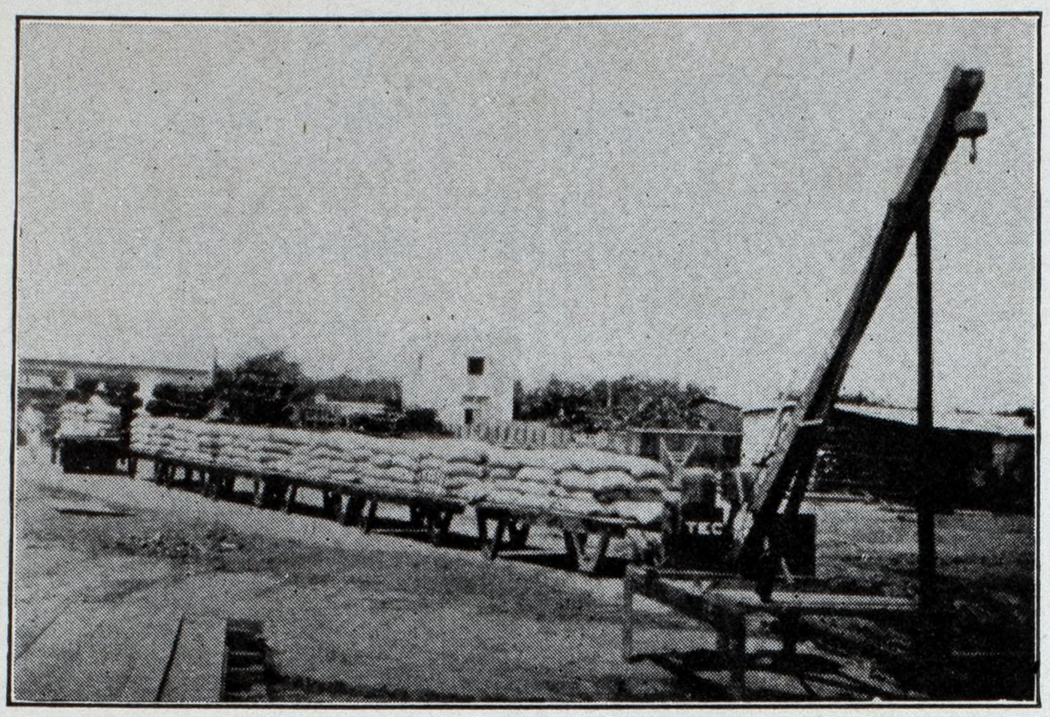
Let Acme engineers help you with constructive suggestions for solving shipping problems of your shippers. This service is free and no obligation is incurred by your writing us.

ACME STEEL COMPANY

2840 Archer Avenue

Chicago

Atlanta	Detroit	Orlando, (Fla.)
Baltimore	Indianapolis	Philadelphia
Boston	Kansas City	Portland
Brooklyn	Los Angeles	St. Louis
Charlotte	Milwaukee	San Francisco
Chattanooga	Minneapolis	Seattle
Cincinnati	Montreal	Toronto
Cleveland	New Orleans	Vancouver
Denver		Winnipeg



The one complete system of mechanical freight handling for marine terminals.

VERSATILITY

Terminal operation requires machinery which can handle any class of freight and change quickly from one class to another. Note operation at Barranquilla, South America, where native labor is cheap, — yet TEC equipment paid for itself in three months.

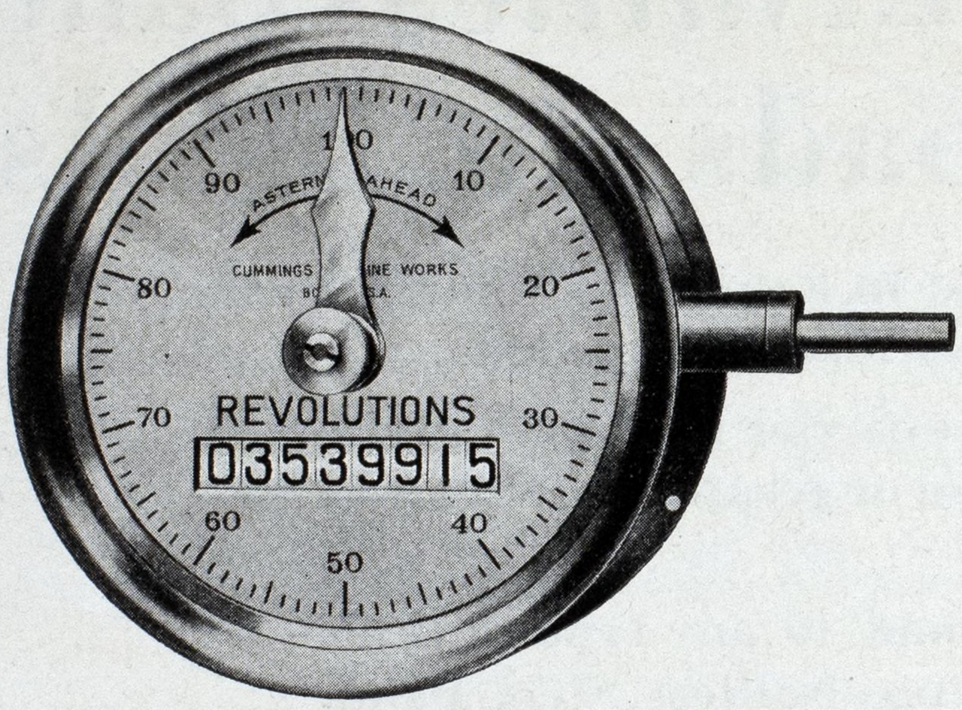
Either lift bodies or crane attachment used interchangeably with the same TEC Truck.

Terminal Engineering Co.

17 Battery Place, New York, N. Y.

Cummings

Combination Counter & Telltale

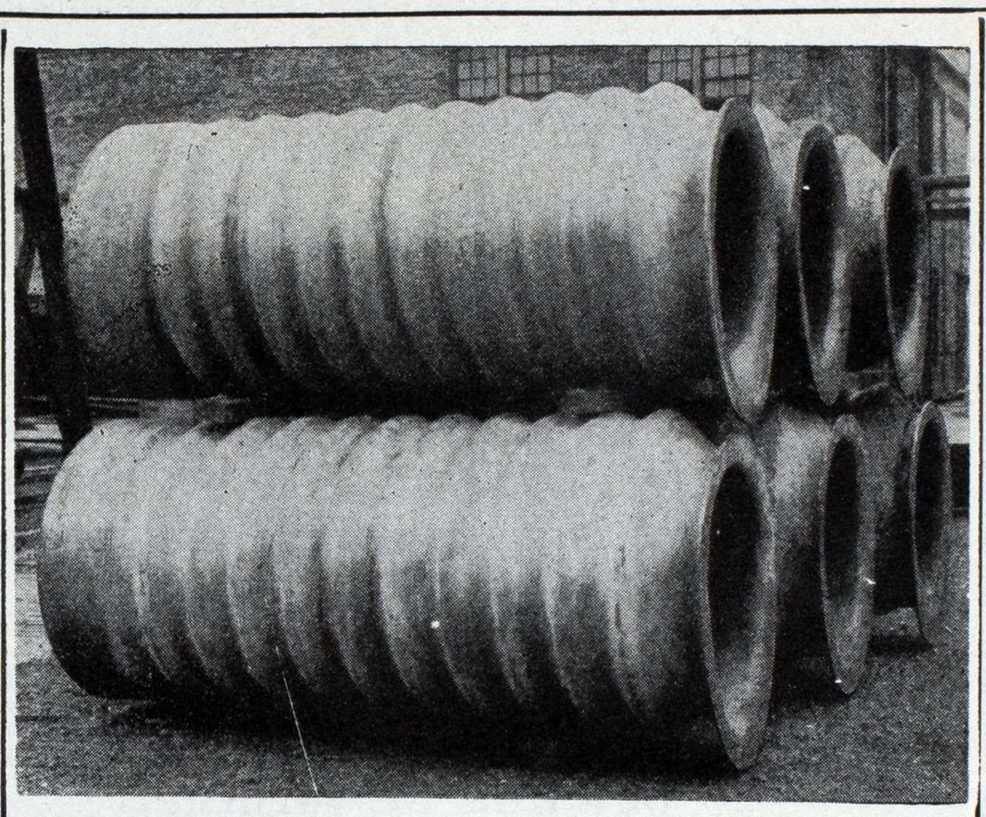


Adopted by the Panama Pacific Line on
S. S. California
S. S. Virginia
S. S. Pennsylvania

Cummings Revolution Counters and
Gary-Cummings Torsion Meters
have been used on
U. S. Naval Vessels Since 1912

Cummings Machine Works

255 Atlantic Ave., Boston, Mass.



Corrugated Marine Furnaces

A full range of sizes

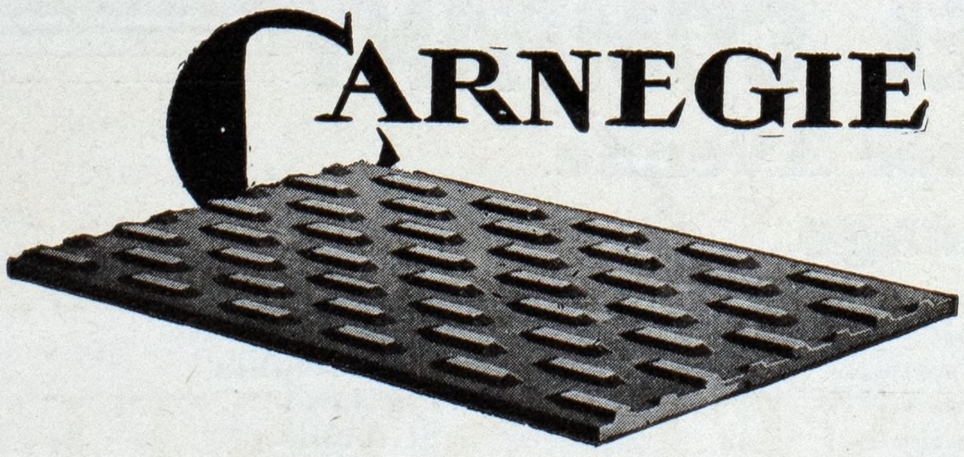
The largest plant capacity in America with more than a thousand tons of firebox furnace plates in stock enables us to meet your demands for quick delivery. Continuous production for many years gives assurance of superior quality.

TAYLOR FORGE & PIPE WORKS

Main Office and Works:
Box 485, Chicago, Ill.
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MR-7Gray

CARNEGIE FLOOR PLATE



Section M-41
Thickness—$\frac{3}{16}$" to $\frac{3}{4}$" exclusive of raised figure.
Width —6" to 66".
Weight —8.8 to 31.7 pounds per square foot.
Recommended for floors, sidewalk openings, stair and traffic treads, where a safe, secure foothold is required. This design drains and cleans easily.

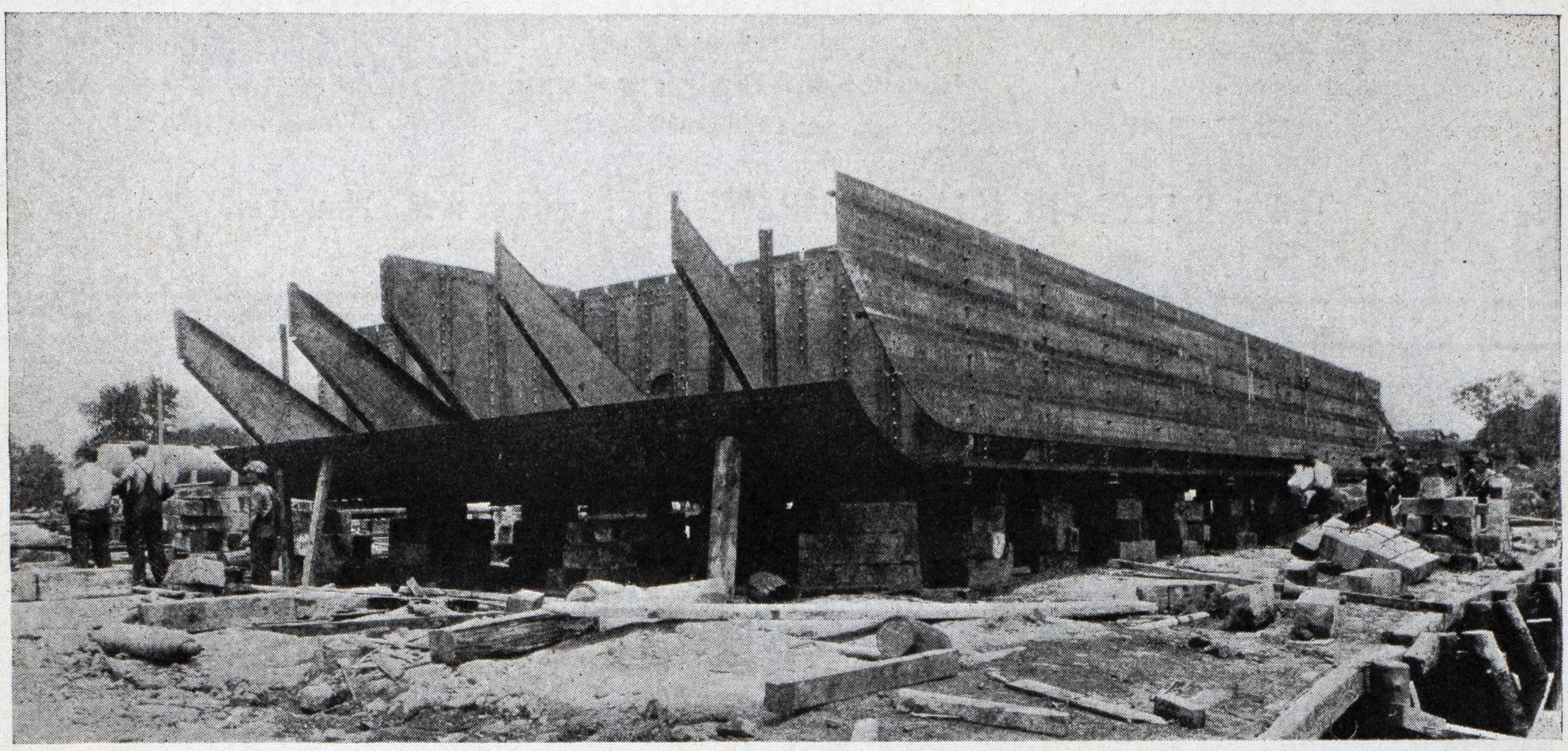
CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION
CARNEGIE BUILDING, PITTSBURGH, PA.

6 More ELLIS Barges For

UNITED STATES ENGINEERS

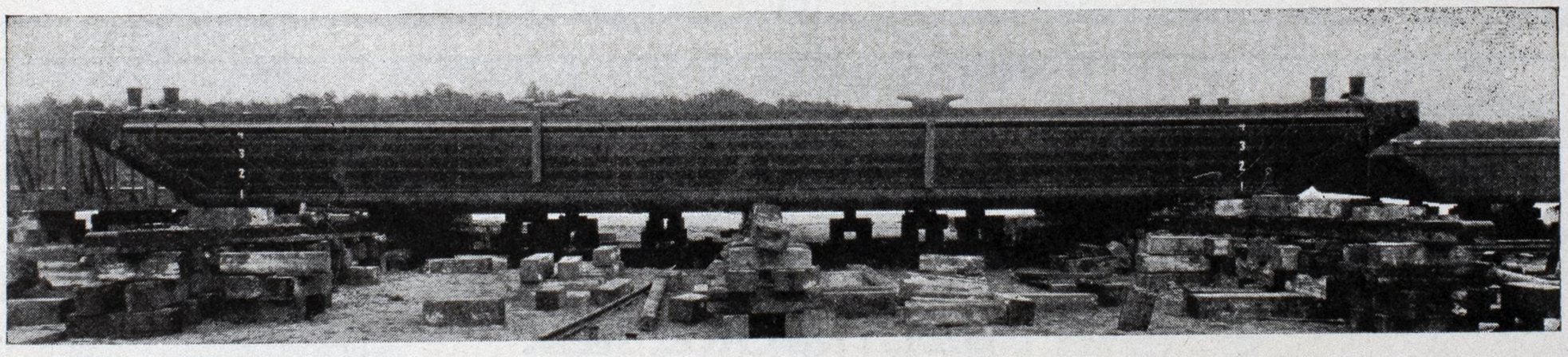
MERRITT, CHAPMAN & SCOTT Corp.



THESE two great leaders were among the first to choose Ellis Barges. The boats are found wherever there is tough work to be done—about New York Harbor, along the Eastern Seaboard, on the Great Lakes. Now both clients are adding more Ellis boats to their fleets.

Pictures show the New Plant of the Atlantic Ellis Channel System, Inc., Seaford, Delaware. Above, the latest Merritt, Chapman & Scott Derrick Barge, 84′ x 33′ x 7′ 6″, under construction. Below, part of an order of five barges now being delivered to the United States Engineers. The dimensions of this barge are 80′ x 26′ x 6′. It will be used for deck loads only.

Detailed information showing how the Ellis Channel System excels in portability for export, while providing the necessary inherent strength for the most varied service, either at home or abroad, will be sent on request.



ELLIS CHANNEL SYSTEM

PATENTED

INCORPORATED

Atlantic Coast, Central and South American Divisions
ATLANTIC ELLIS CHANNEL SYSTEM, INC.
33 Rector St., New York

Pacific Division
ELLIS CHANNEL SYSTEM, INC.
3200 26th Ave. Southwest, Seattle, Wash.

Great Lakes Division
MANITOWOC SHIP BUILDING CORP., INC.
Manitowoc, Wis.

Griscom-Russell

Heat Transfer Apparatus

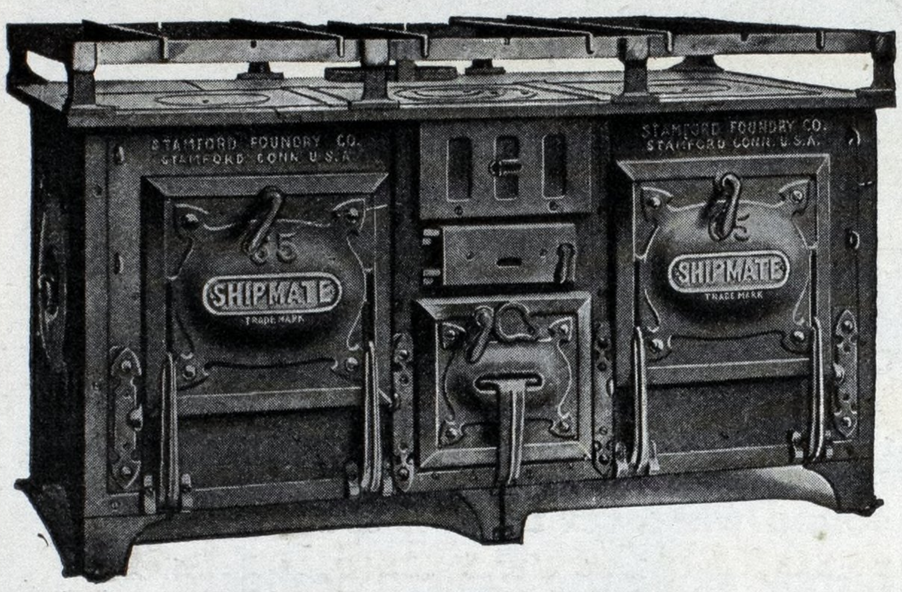
Reilly Heaters
For boiler feed and general service
Serving over 12,000,000 BHP

Evaporators
(Scale-Shedding)
Bentube and Reilly Types
Serving over 10,000,000 BHP

Multiwhirl Coolers
For cooling oil to turbine bearings and reduction gears. For cooling Diesel engine jacket water.
Thousands in use.

THE GRISCOM-RUSSELL COMPANY, 285 Madison Ave., New York
Chicago: Monadnock Bldg.

*2



No. 65 SHIPMATE RANGE

If "cheap" means low-priced, SHIPMATES don't qualify; but if the word means the most for the money, SHIPMATES are the cheapest ranges we know of.

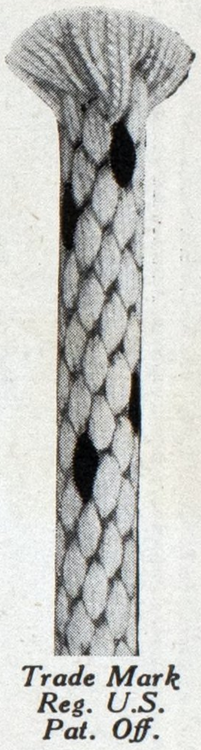
SHIPMATES are made only by
THE STAMFORD FOUNDRY COMPANY
Established 1830 Stamford, Conn.

SAMSON SPOT

Log Lines

Smooth, tough and durable; no adulterating material to stiffen it and decrease strength and durability. Solid braided of extra quality cotton yarn. Uniform in size and quality. Easily identified by the colored spots, our trade mark.

We also manufacture flag halyards, lead lines, tiller rope; solid braided cotton cord in all sizes for various marine uses. Ask for catalog and samples.



Trade Mark Reg. U.S. Pat. Off.



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TRADE MARK

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The Maryland Dry Dock Company

BALTIMORE, MD.

Drydocking, Shipbuilding and Ship Repairs of All Kinds
The Most Modern Shops in Baltimore 2—9000 Ton Floating Drydocks
Floating Machine Shop

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Plant Phones: Curtis 0500 - 0501 - 0502 - 0503



Palomar of San Diego, equipped with 240 hp. F-M Diesel Engine

Watchdogs of the Sea

Like watchdogs of the sea F-M Diesel Tugs stand by, always ready to carry out the orders of their owners and protect shipping.

Stationed at San Diego is the Palomar of the Star and Crescent Boat Company.

An emergency call can never catch her unprepared. She does not have to wait for steam to come up or waste time on extra coaling for a long trip out to sea. And when she ties up, there are no fires to bank and all mechanical expense ceases.

Powered with a 240 hp. F-M Diesel Engine she is always ready with a speed of 11½ miles per hour and a cruising range of 5000 miles to handle any kind of work at a profit to her owners.

POWER, PUMPING AND WEIGHING EQUIPMENT

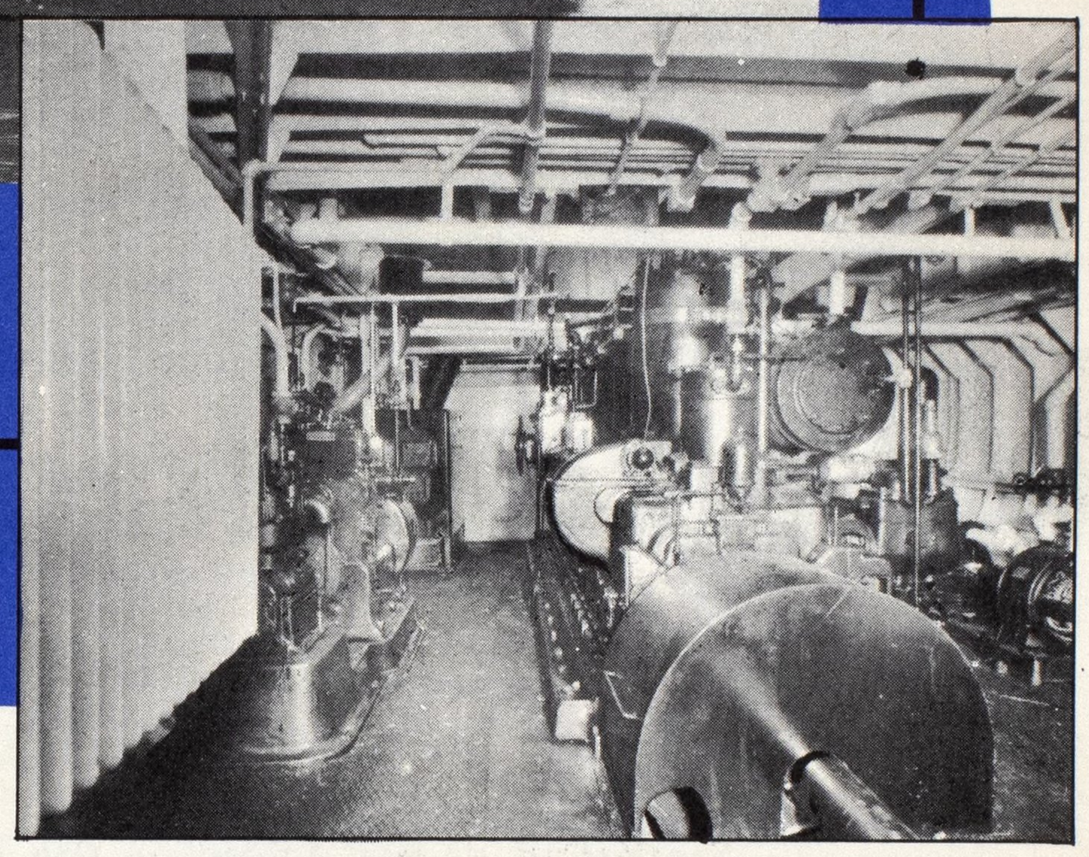
FAIRBANKS-MORSE DIESEL ENGINES

FAIRBANKS-MORSE DIESEL ENGINES

FAIRBANKS-MORSE DIESEL ENGINES



Reading Railway Diesel Tug
Harold J. Taggert



Engine Room Showing F-M Diesel Equipment

Meeting the demand of railroads

Railroad tugs have become such a vital factor in handling the congested transportation on the Atlantic seaboard that eastern carriers have made special studies of this equipment.

Leading roads have found that Fairbanks-Morse Research and Development have perfected a simple, reliable type of Diesel that meets every demand for speed, maneuvering ability and high economy in railroad tug service.

The latest addition to the railroad fleet is the new steel tug, Harold J. Taggert, owned by the Reading Railway. She is Fairbanks-Morse equipped throughout with a 6 cylinder 14″ x 17″ Diesel Propulsion Engine with auxiliaries—an 18 kw. Diesel generating and compressor set and 3″ motor driven pump.

The Harold J. Taggert displaced a steam tug of practically the same size and power with the result that one hour has been cut off the running time towing car floats between Pigeon Point, Delaware, and Thompson's Point, New Jersey.

FAIRBANKS, MORSE & CO., *Chicago*
Branches with Service Stations in Principal Ports

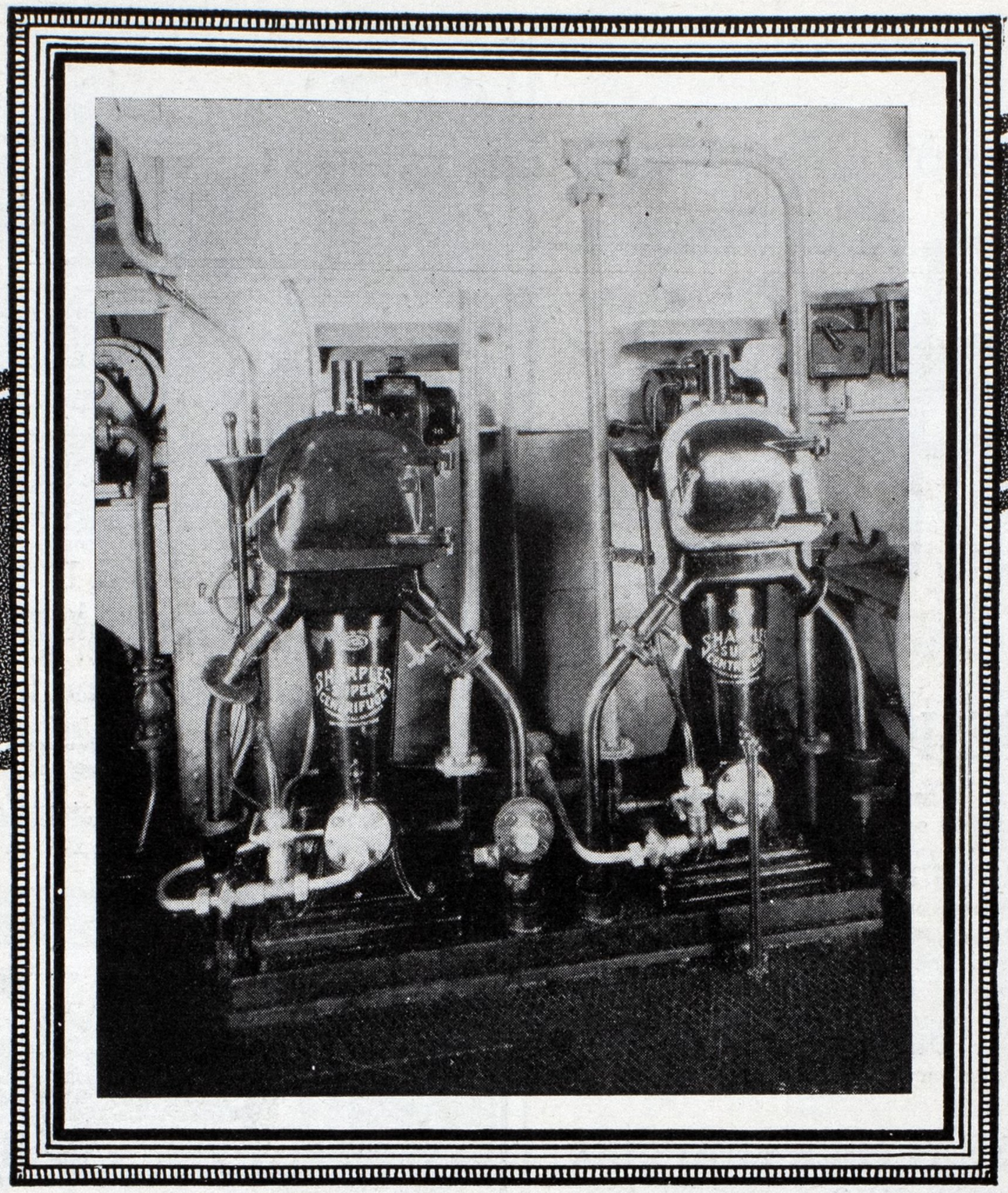


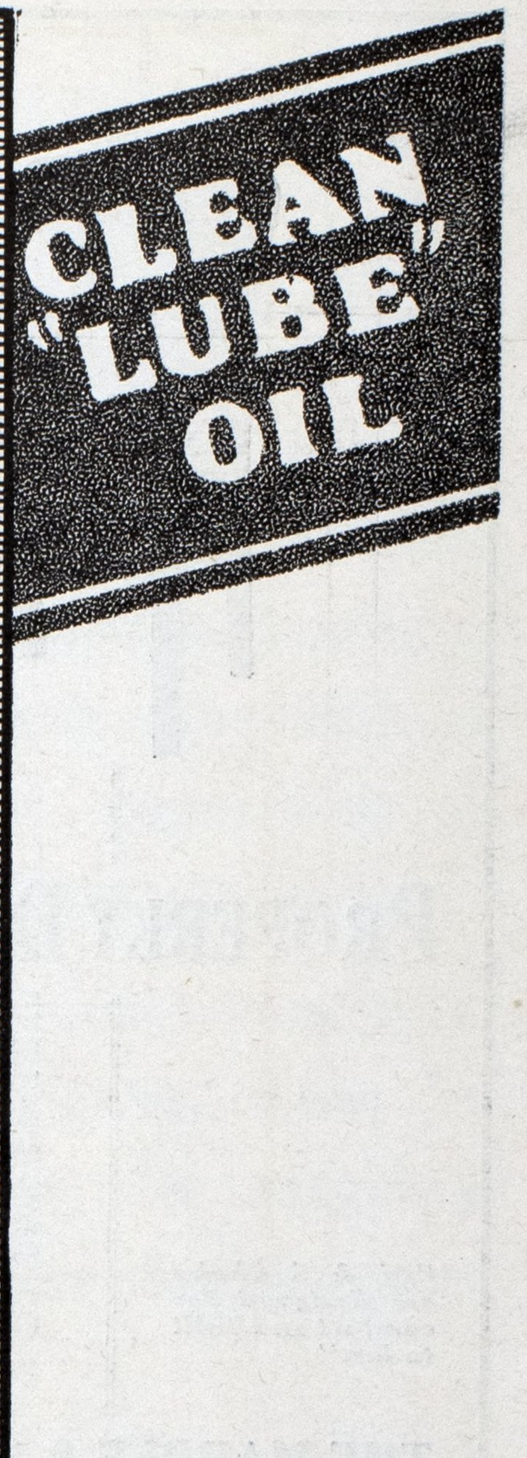
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FAIRBANKS-MORSE

DIESEL ENGINES

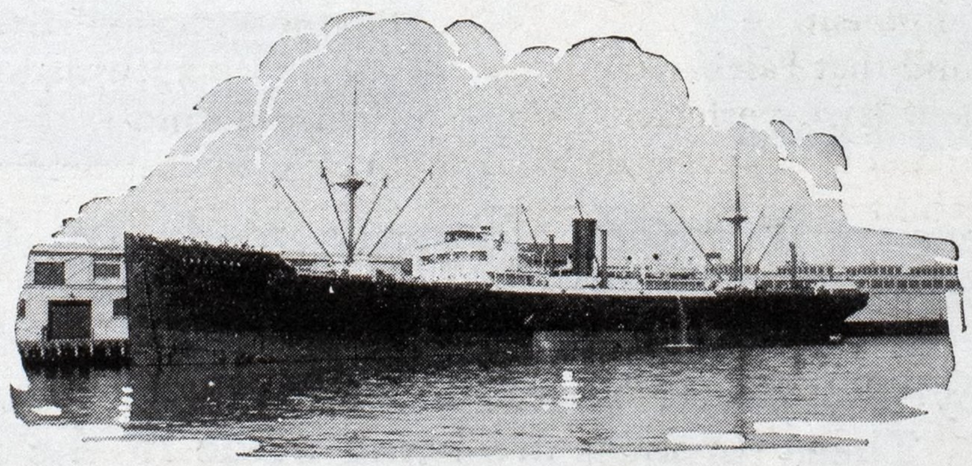






Reardon Smith Lines use SHARPLES fuel oil "Presurtites" on M.S. East Lynn

"Sharples preferred" seems to be a popular slogan of the great shipping firms of today. With the selection of Sharples Oil Purifiers by the Reardon Smith Lines, another prominent marine organization has been added to the long list of Sharples users.



M. S. EAST LYNN

The East Lynn, a fine modern motorship built for Reardon Smith Lines by Wm. Doxford & Sons, Ltd., carries two Sharples machines — both "Presurtites" (totally enclosed) for fume-proof purification of fuel oil, and continuous purification of "lube" oil.

A copy of the new Sharples booklet on Diesel oil purification is yours for the asking. It's a book every Diesel Engineer will value highly.

THE SHARPLES SPECIALTY COMPANY, 2338 WESTMORELAND STREET, PHILADELPHIA. Boston, New York, Richmond, Pittsburgh, Chicago, Detroit, Tulsa, New Orleans, San Francisco, Los Angeles, Toronto, London, Paris, Tokio

SHARPLES
A GREAT FORCE



For the dining salons of
S. S. Virginia
S. S. Pennsylvania
S. S. California
we designed and built more than 1000 of these beautiful chairs.

PROPERLY DESIGNED CHAIRS

"M & S Chairs are designed for comfort and built to last"

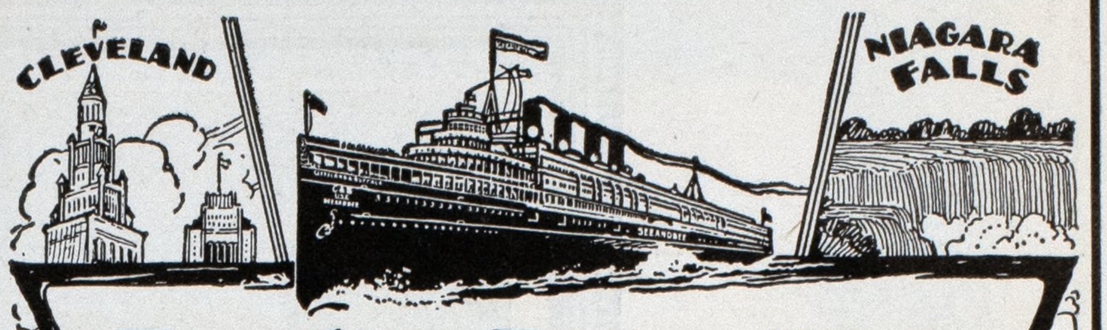
For Steamship use must be of rugged construction to give satisfactory service. Years of experience designing and constructing chairs for every purpose—hotels, banks, steamships, corporations and public buildings—permit us to give valuable and free advice to Architects and Dealers figuring on large installations. Our Designing Department is at your service.

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Traveling East *or* West

Enjoy a restful night on Lake Erie on board one of the palatial

C & B Line Steamers

Beautiful scenery. Comfortable staterooms, luxurious cabins, wide decks, excellent dining service and courteous attendants. Music and dancing on the Great Ship "SEEANDBEE".
Autoists, save a day C & B Line way. Avoid miles and miles of congested roadway.

Cleveland and Buffalo Division

Each way, every night, leaving 9:00 p. m.; arriving 7:30 a.m. (E S T.) May 1st to Nov. 15th. New Low Fares, $4.50 one way. $8.50 round trip. Autos carried $6.50 and up.

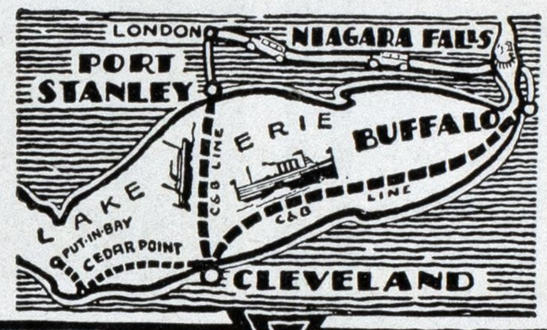
Cleveland and Port Stanley, Ontario, Division

Daily service, leaving Cleveland, 12:00 midnight, arriving Port Stanley, 6 00 a m ; leave Port Stanley, 4:00 p. m., arrive Cleveland 9:30 p. m. (E. S. T.) June 29th to Sept. 8th. New Low Fares, $3.00 one way, $5.00 round trip. Autos carried $4.50 and up.

THE CLEVELAND AND BUFFALO TRANSIT COMPANY

Cleveland, Ohio :: Buffalo, N. Y. :: Times Bldg., New York City

Connections at Buffalo and Port Stanley for Canadian and Eastern points; at Cleveland, for points West and Southwest.



Ask for our No. 25 C & B Folder with Auto Map and details on trips.

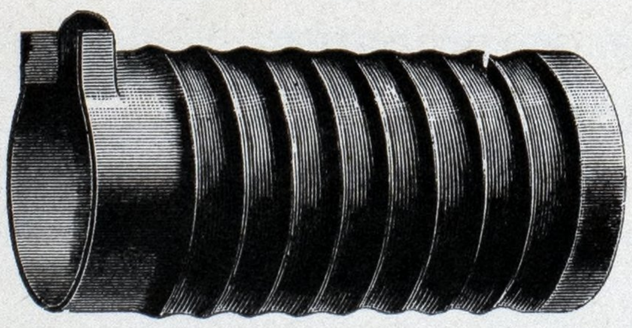
Daily Excursions, Cleveland to Cedar Point and Put-in-Bay, June 9th to Sept. 2nd



"Save a Day - C&B Line Way"

MORISON Suspension Furnaces

FOR SCOTCH MARINE BOILERS



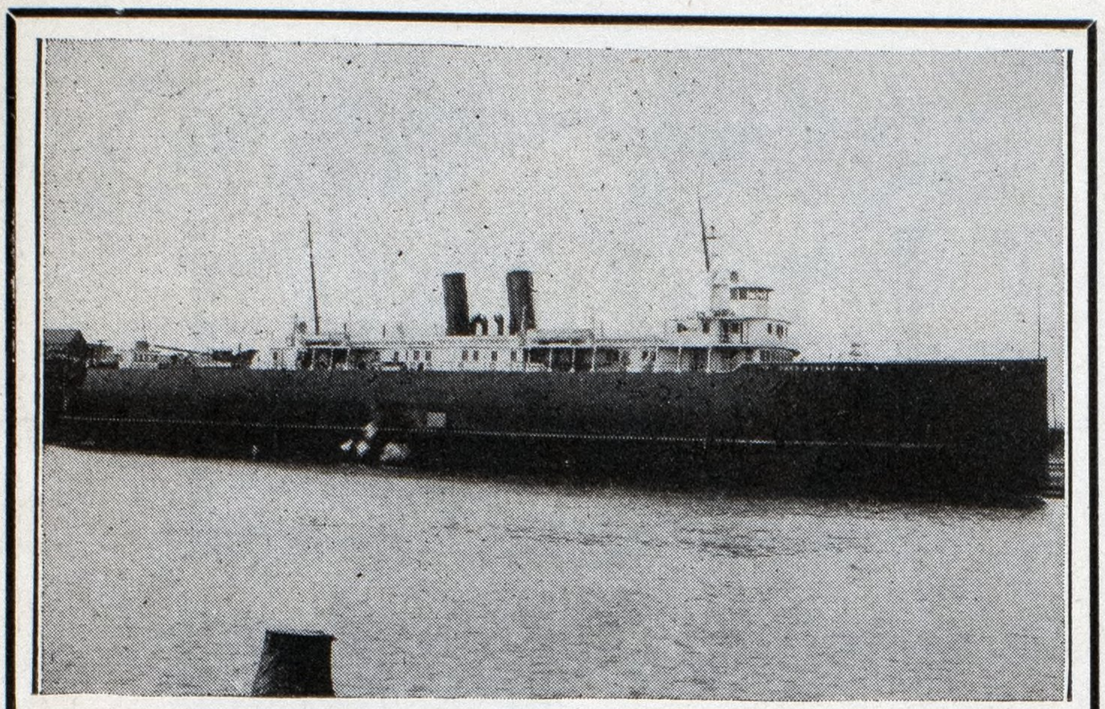
Made to United States, American Bureau of Shipping, Lloyds, Brueau Veritas, or any other requirements. A useful folder, giving working pressures for various sizes of furnaces, will be mailed on request.

ROWLAND PROCESS FORGE WELDED
EVERLASTINGLY TIGHT

Morison Suspension Furnaces, formerly made by the Continental Iron Works (established 1859), are too well known throughout the shipping world to need any detailed description. No marine equipment ever enjoyed a better reputation for uniform quality and satisfactory service. These furnaces are being made in the same way as in the past, with special equipment which was purchased from the Continental Iron Works when that concern retired from business. Deliveries can be made very promptly.

AMERICAN WELDING COMPANY

30 Church St., New York—Telephone Cortlandt 8110 ***Works, Carbondale, Pa.***



Meeting Your Requirements

That's our job. Regardless of the size or type of Marine equipment you plan to build, we can meet your requirements.

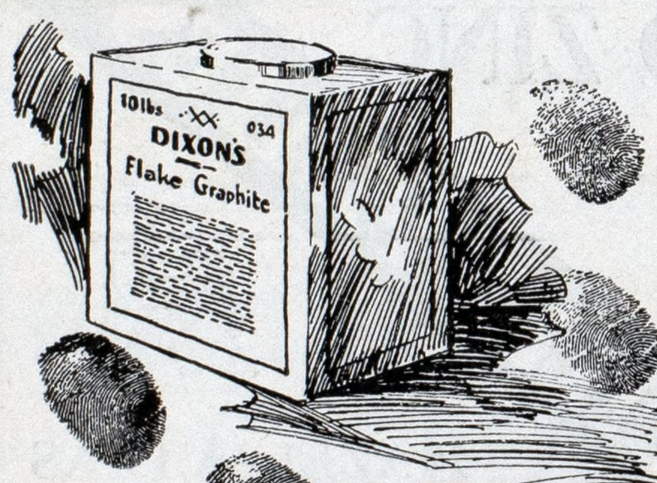
Our experienced organization and shop equipment insure workmanship that makes Manitowoc-built ships and marine equipment outstanding in marine circles.

Let us figure on your requirements.

MANITOWOC SHIPBUILDING CORP.

Manitowoc, Wisconsin

MANITOWOC



DIXON'S *fingerprints*

written in FLAKE GRAPHITE
for more than 100 years

This is the identifying mark of *Dixon's . . . Graphite.* The combination, *Dixon's* and *Graphite*, have been synonymous all over the world for more than 100 years.

And, another word that is closely linked with these two is—*lubrication.* These three are inseparably linked in the minds of thousands of mechanics, maintenance men, and engineers, for unquestionably *Dixon's Flake Graphite* has its place in every well planned scheme of lubrication, and as an auxiliary lubricant with oils and greases it is generally recognized as benefiting the base lubricant.

If you have never had the *how, where,* and *why* of Dixon's Flake Graphite lubrication explained to you, write for it today. Or, better still, send us an outline of your lubricating problems and we'll tell you how Dixon's can help you.

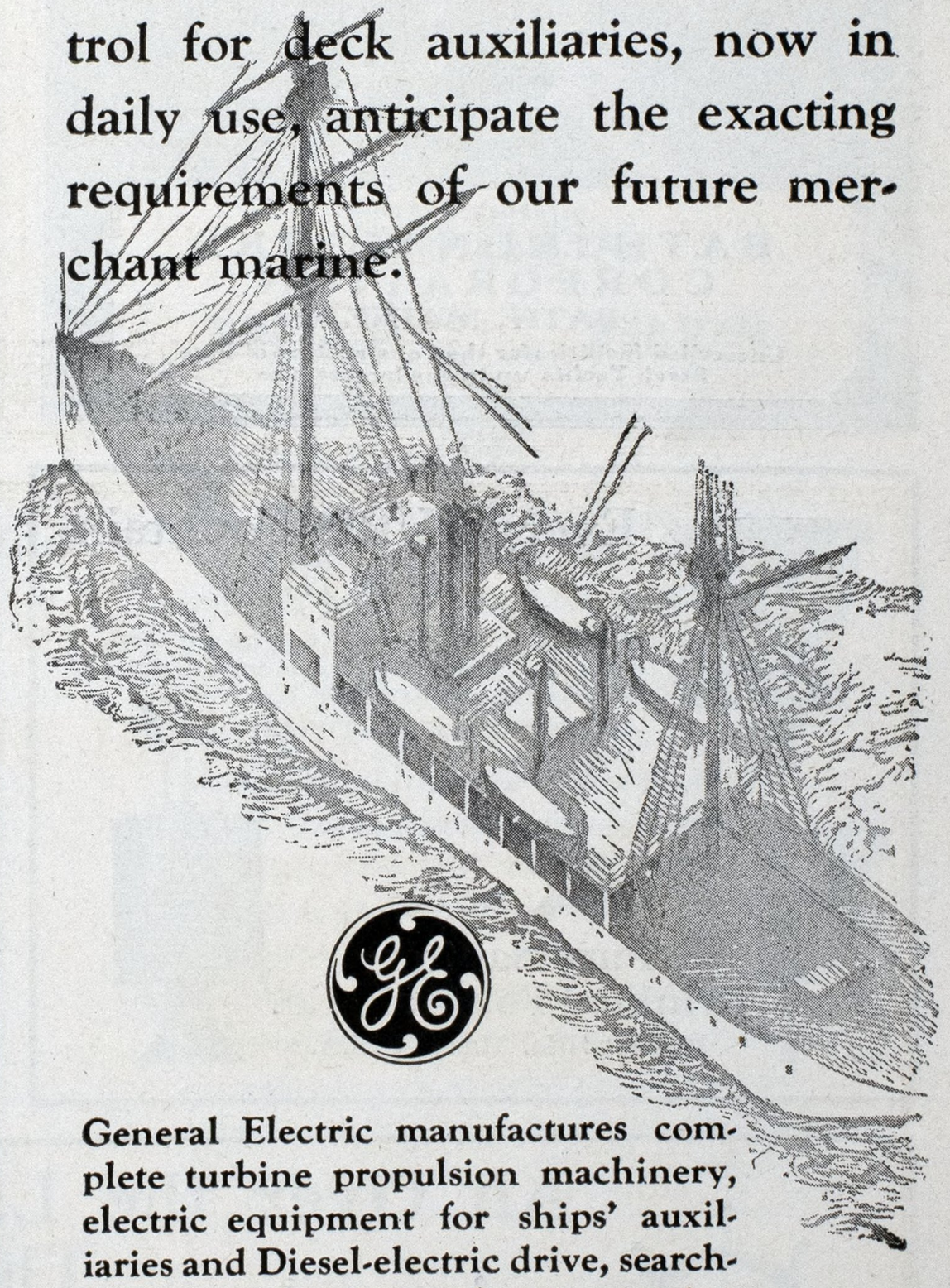
Joseph Dixon Crucible Company

Jersey City D X N TRADE MARK New Jersey

Established 1827

BROILING sun, biting wintry gales, and lashing seas leave unaffected the electric motors and control which actuate deck auxiliaries. Water-tight housings and corrosion-resisting fittings protect these faithful deck hands which speed docking, embarking, loading, and unloading. Their operation is simple and certain, regardless of the experience of the operator.

General Electric motors and control for deck auxiliaries, now in daily use, anticipate the exacting requirements of our future merchant marine.



General Electric manufactures complete turbine propulsion machinery, electric equipment for ships' auxiliaries and Diesel-electric drive, searchlights, and other electric marine accessories. Descriptive literature or the services of a marine-engineer specialist will be furnished promptly if requested of the nearest G-E office.

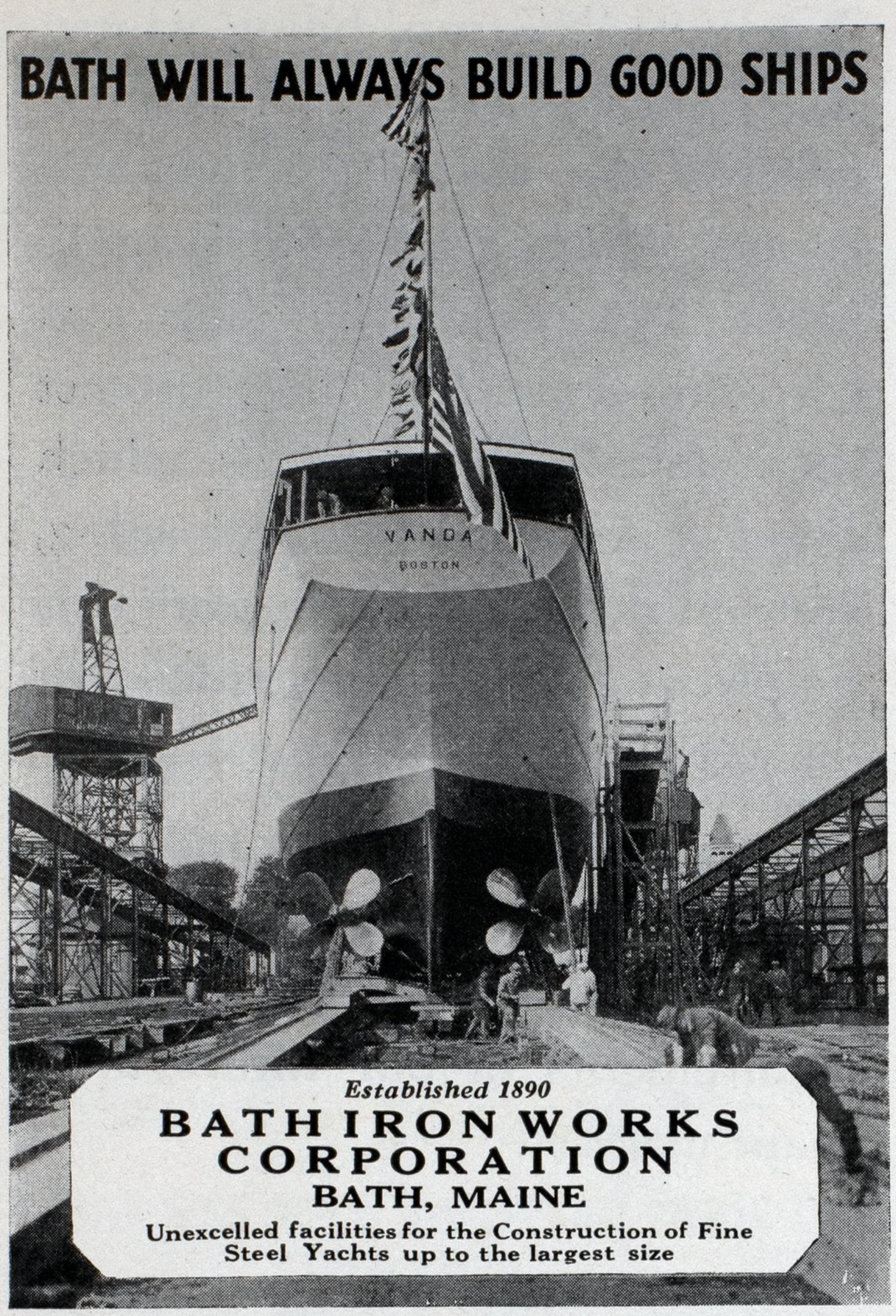
231-22

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P. M., E. S. T. ON A NATION-WIDE N. B. C. CHAIN

GENERAL ELECTRIC

General Electric Co., Schenectady, N. Y., Sales Offices in Principal Cities

BATH WILL ALWAYS BUILD GOOD SHIPS



Established 1890

BATH IRON WORKS CORPORATION

BATH, MAINE

Unexcelled facilities for the Construction of Fine Steel Yachts up to the largest size

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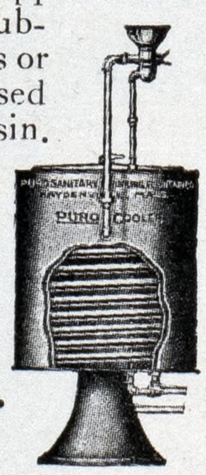


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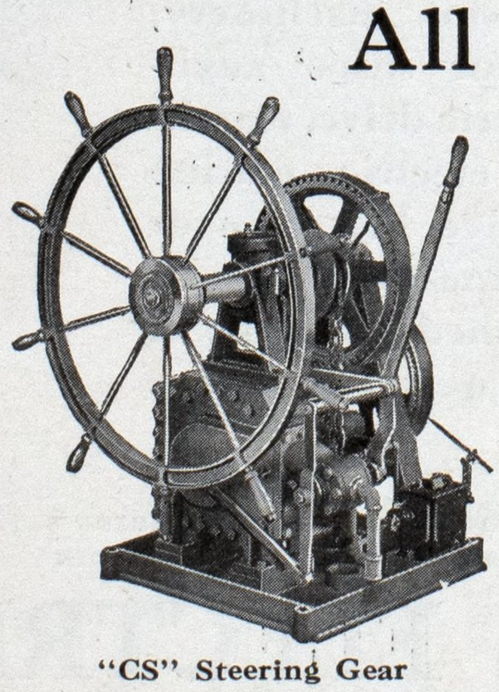
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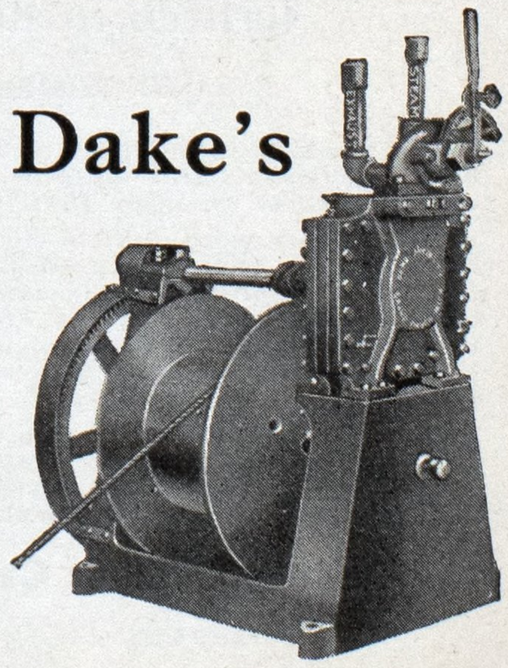


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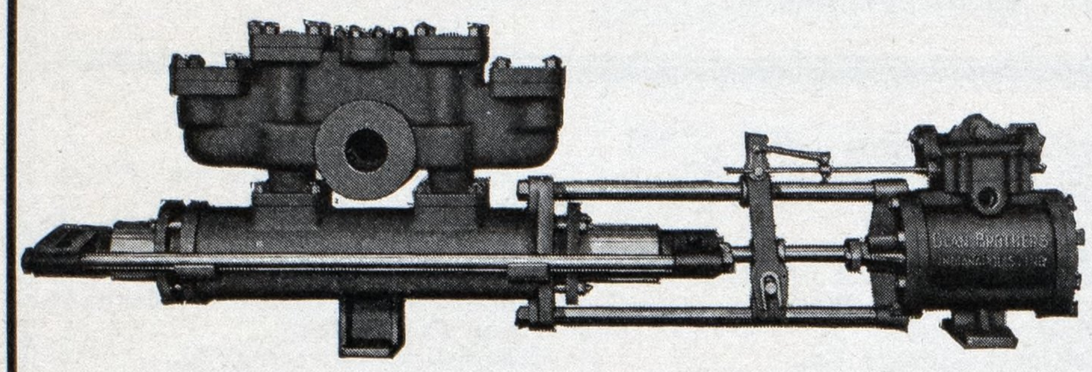


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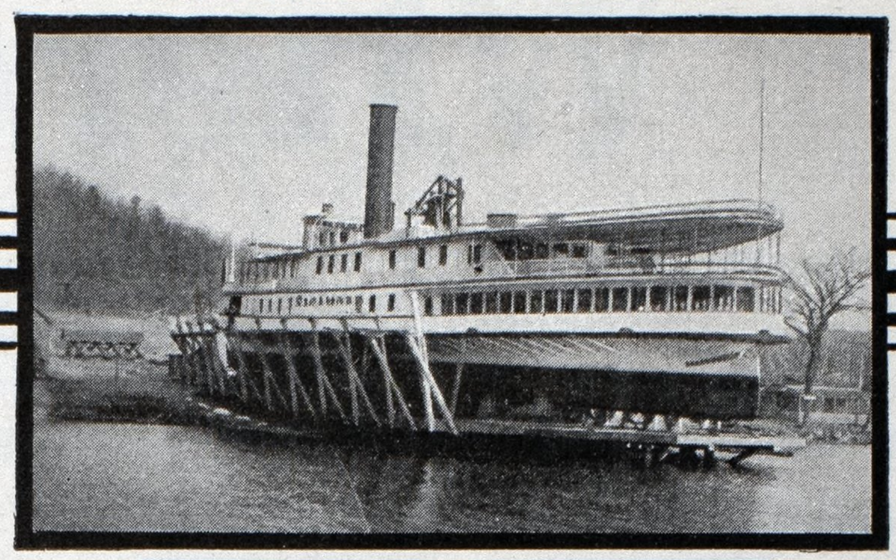
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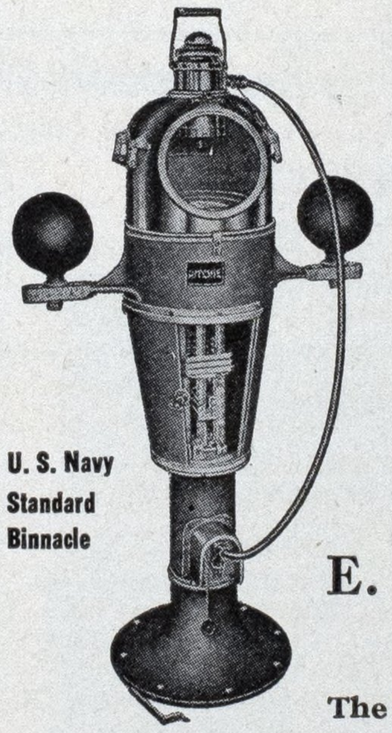
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Texas Co., The, 17 Battery Place, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

OXYGEN (Gas)
Linde Air Products Co., 30 East 42nd St., New York City.

PASSENGER SERVICE
Hamburg-American Line, 39 Broadway, New York City.

PIPE (Iron and Steel)
Taylor Forge and Pipe Works, 1440 S. 49th St., Chicago, Ill.

PLATFORMS (Lift Trucks)
Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill.

PORT FACILITIES
Newark, Port of City Hall, Newark, N. J.

POWDERED COAL BURNERS
Coen Co., Inc., 50 Church St., New York City.

PROPELLER BLADES AND HUBS
Sheriffs Mfg. Co., Milwaukee, Wis.

PROPELLER WHEELS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Detroit Ship Building Co., Detroit, Mich.
Great Lakes Engineering Works, River Rouge, Mich.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Sheriffs Mfg. Co., Milwaukee, Wis.
Toledo Shipbuilding Co., Toledo, O.
Trout, H. G Co., 220 Ohio St., Buffalo, N. Y.

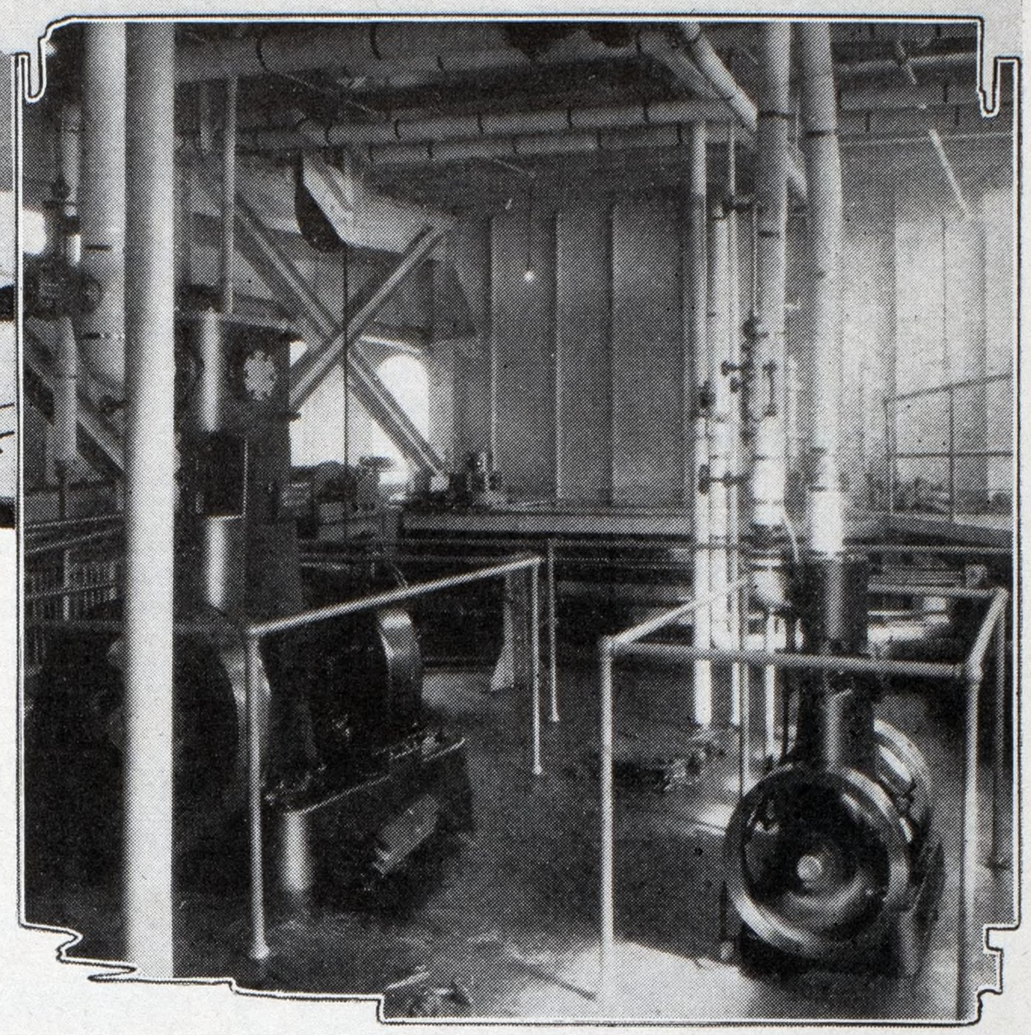
PROPELLERS
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Hyde Windlass Co., Bath, Me.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.

PULVERIZED COAL BURNERS
Todd Shipyards Corp., 25 Broadway, New York City.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

New Slider Towboat Equipped with ENGBERG Generating Sets





BECAUSE other users recommended ENGBERG Improved Marine Generating Sets so highly, the C. C. Slider Company of Louisville, Ky., specified and insisted upon ENGBERG 3½ and 15 K.W. Units and switchboard for their new towboat illustrated above.

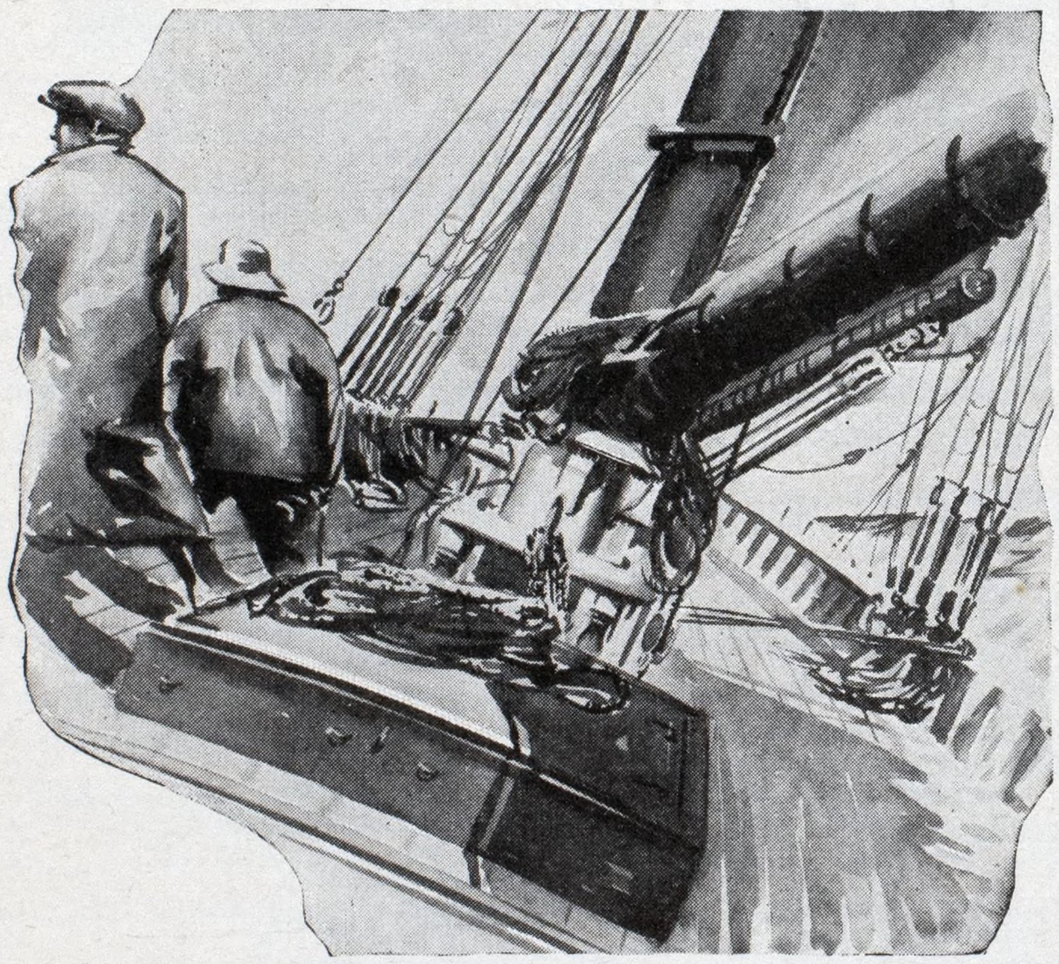
Whenever you have occasion to specify or purchase Generating Sets, we suggest that you ask several ENGBERG users regarding the performance of ENGBERG Equipment. You will be amazed at the reports of long, continuous service with practically no maintenance and attention, and at the excellent oil and steam economy. Send for descriptive catalog No. 105.

ENGBERG'S ELECTRIC & MECHANICAL WORKS
2232 Vine Street, St. Joseph, Michigan

ENGBERG

GUARANTEED OPERATION

ENGBERG 3½ and 15 K.W. Improved Marine Generating Sets on towboat C. C. SLIDER. Notice 3½ K. W. Unit running and sharp lines of photograph, indicating smoothness of operation.



"Then Ho for the sea so damp and free"

Deep sea sailormen realize that in a well-caulked tight bottom lies not only the welfare of the vessel and the crew but the safe delivery of the cargo.

For a hundred years,

STRATFORD OAKUM

has been keeping the ocean out of the finest ships that sail. Sailors depend on Stratford Oakum because they know it is the best.

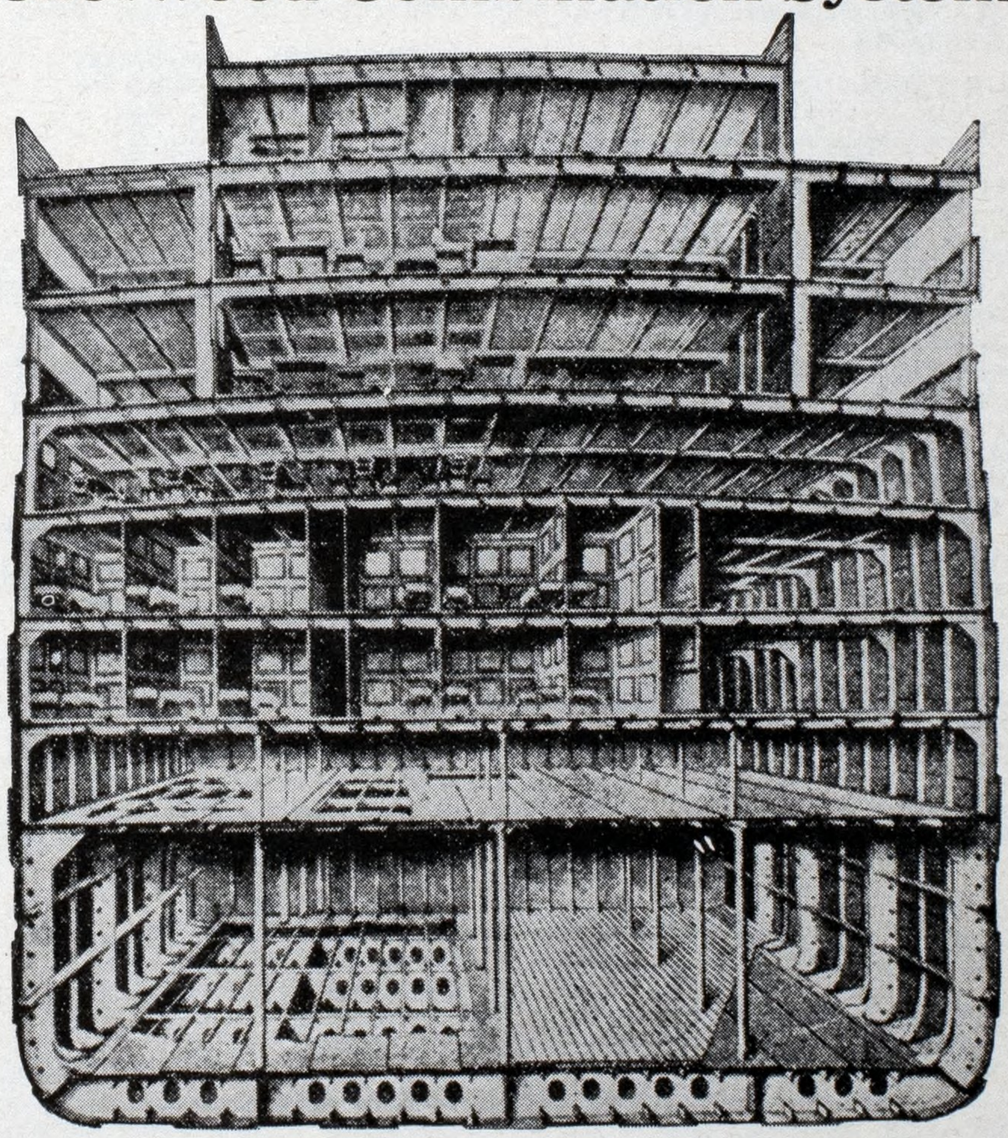
Stratford Oakum is most economical to use. Wastage is very small, less labor is required to spin and caulk and it "stays put," whether in deck, side or bottom.

Seams right-caulked with Stratford Oakum will stay tight longer than when any other material is used.

Be sure you get Stratford Oakum

George Stratford Oakum Company
Jersey City, New Jersey
Also Manufacturers of Cotton Wiping Waste *5

Isherwood Combination System



Sectional View of Interior of Passenger Liner designed on the Isherwood Combination System
('n a vessel of this type, deep transverses are recommended for hold construction, but are not essential.)
Adaptable to any type but particularly advantageous for passenger liners.

Shipowners are advised to specify that plans and structural arrangements should be approved by

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17 BATTERY PLACE, NEW YORK
and 4, LLOYD'S AVENUE, LONDON, E. C. 3 2

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Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.
Great Lakes Engineering Works, River Rouge, Mich.
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS (Ballast)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.

PUMPS (Bilge)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

PUMPS (Boiler Feed)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

PUMPS (Direct Acting)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.

PUMPS (Fuel Oil)
Coen Co., Inc., 50 Church St., New York City.

PUMPS (Power)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

PUMPS (Steam)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

PUMPS (Vacuum)
Dean Brothers Co., 323 W. Tenth St., Indianapolis, Ind.

PURIFICATION SYSTEMS—See WATER PURIFICATION SYSTEMS

PURIFIERS (Oil)
Sharples Specialty Co., Westmoreland, Philadelphia, Pa.

RACKS (Storage)
Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill.

RADIO COMPASS AND DIRECTION FINDER
Radiomarine Corp. of America, 66 Broad St., New York City.

RADIO EQUIPMENT
Radiomarine Corp. of America, 66 Broad St., New York City.

RAFTS
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.

RAILWAY DRY DOCKS
Crandall Engineering Co., 134 Main St., Cambridge, Mass.

RANGES
Stamford Foundry Co., Stamford, Conn.

REPAIRS
Maryland Dry Dock Co., Baltimore, Md.

REPAIRS (Electric)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

REPAIRS (Marine)
Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.
American Shipbuilding Co., Foot of W. 54th St., Cleveland. O.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Collingwood Shipyards, Ltd., Collingwood, Ont., Canada.
Chicago Shipbuilding Co., So. Chicago, Ill.
Great Lakes Engineering Works, River Rouge, Mich.
Jahncke Dry Docks, Inc., New Orleans, La.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Todd Shipyards Corp., 25 Broadway, New York City.
Toledo Shipbuilding Co., Toledo, O.
United Drydocks, Inc., 11 Broadway, New York City

REPAIRS (Marine Engines)
Bath Iron Works Corporation, Bath, Maine.
Collingwood Shipyards, Ltd., Collingwood, Ont., Canada.

REPAIRS (Turbine)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

REVOLUTION COUNTERS
Cummings Machine Works, 255 Atlantic Ave., Boston, Mass.
Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.

ROPE (Manila, Net, Sisal, and Other Hard Fiber Cordage)
Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works, Boston, Mass.
Whitlock Cordage Co., 46 South St., New York City.

ROPE (Transmission)
Columbian Rope Co., Auburn, N. Y.

ROPE OAKUM
Stratford, George, Oakum Co., Jersey City, N. J.

RUBBER TILE
Selby Battersby & Co., 810 Noble St., Philadelphia, Pa.

RUST PREVENTATIVE (Oil)
Texas Co., The, 17 Battery Place, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

SAFETY VALVES (Marine)
Star Brass Mfg. Co., 53 Oliver St., Boston, Mass.

SCHOONERS (Auxiliary)
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Chicago Shipbuilding Co., So. Chicago, Ill.
Toledo Shipbuilding Co., Toledo, O.

SEARCHLIGHTS (High Intensity)
Sperry Gyroscope Co., The, Brooklyn, N. Y.

SEARCHLIGHTS (Incandescent and Arc)
General Electric Co., Schenectady, N. Y.
Sperry Gyroscope Co., The, Brooklyn, N. Y.

SELF UNLOADING EQUIPMENT
Smith, Leathem D., Dock Co., Sturgeon Bay, Wis.

SEPARATORS (Oil)
Babcock & Wilcox Co., 85 Liberty St., New York City.
Sharples Specialty Co., Westmoreland, Philadelphia, Pa.

SHAFTING COVERING
Paper & Textile Machinery Co., Sandusky, O.

SHIPBUILDERS
Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Bath Iron Works Corporation, Bath, Maine.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Collingwood Shipyards, Ltd., Collingwood, Ont., Canada.
Great Lakes Engineering Works, River Rouge, Mich.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Maryland Dry Dock Co., Baltimore, Md.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
Smith, Leathem D., Dock Co., Sturgeon Bay, Wis.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Todd Shipyards Corp., 25 Broadway, New York City.
Toledo Shipbuilding Co., Toledo, O.
United Drydocks, Inc., 11 Broadway, New York City.

SHIPBUILDING SYSTEMS
Isherwood, J. W., 17 Battery Place, New York City.

SHIP CONSTRUCTION (Channel System)
Atlantic Ellis Channel System, Inc., 33 Rector St., New York City.

SHIP LOGS
Walker, Thomas, & Son, Ltd. 58 Oxford St., Birmingham, England.

SHIP STABILIZERS
Sperry Gyroscope Co., The, Brooklyn, N. Y.

SLEEVES (Rubber)
Paper & Textile Machinery Co., Sandusky, O.

SPUN OAKUM
Stratford, George, Oakum Co., Jersey City, N. J.

STEAMSHIP COMPANIES (Lake Passenger and Freight)
Cleveland & Buffalo Transit Co., E. 9th Pier, Cleveland, O.

STEAMSHIP LINES (Passenger and Freight)
Hamburg-American Line, 39 Broadway, New York City.

STEAM GAGES
Star Brass Mfg. Co., 53 Oliver St., Boston, Mass.

STEAM TRAPS
Davis Engineering Co., 90 West St., New York City.

STEEL BARGES—See BARGES (Steel)

STEERING ENGINES
Hyde Windlass Co., Bath, Me.

STEERING GEARS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Hyde Windlass Co., Bath, Me.

STORAGE BATTERIES—See BATTERIES

STOVES
Stamford Foundry Co., Stamford, Conn.

STRAINERS (Oil)
Coen Co., Inc., 50 Church St., New York City.

STRIP STEEL
Acme Steel Co., 2840 Archer Ave., Chicago, Ill.

SWITCHBOARDS
Engberg's Electric & Mechanical Works, 2229 Vine St., St. Joseph, Mich.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TELEMOTORS
Hyde Windlass Co., Bath, Me.

TORSION METERS
Cummings Machine Works, 255 Atlantic Ave., Boston, Mass.

TOWING LINES
Columbian Rope Co., Auburn, N. Y.
Whitlock Cordage Co., 46 South St., New York City.

TRACTORS
Clark Tructractor Co., Battle Creek, Mich.
Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill.
Stuebing Cowan Co., 312 Court St., Cincinnati, O.
Terminal Engineering Corp., 17 Battery Place, New York City.

TRANSMISSION (Rope)—See ROPE (Transmission)

TRUCKS
Clark Tructractor Co., Battle Creek, Mich.

TRUCKS (Barrel)
Barrett-Cravens Co., 1328 West Manroe St., Chicago, Ill.

TRUCKS (Lift)
Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill.
Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill.
Stuebing Cowan Co., 312 Court St., Cincinnati, O.
Terminal Engineering Corp., 17 Battery Place, New York City.

TURBINES (Electric)
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

TURBINES (Marine)
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

TURBINES (Steam)
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

TWINE AND ROPE
Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works, Boston, Mass.
Whitlock Cordage Co., 46 South St., New York City.

VALVES AND FITTINGS
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.

VENTILATING EQUIPMENT
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

WAREHOUSE FACILITIES
Newark, Port of City Hall, Newark, N. J.

WATER PURIFICATION SYSTEMS
Griscom-Russell Co., 285 Madison Ave., New York City.

WELDERS (Electric Arc)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING GAS
Prest-O-Lite Co., Inc., 30 East 42nd St., New York City.

WHISTLES
Star Brass Mfg. Co., 53 Oliver St., Boston, Mass.

WINCHES
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Dake Engine Co., Grand Haven, Mich.
Hyde Windlass Co., Bath, Me.

WINDLASSES
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Dake Engine Co., Grand Haven, Mich.
Hyde Windlass Co., Bath, Me.

WIRELESS MESSAGE SERVICE
Radiomarine Corp. of America, 66 Broad St., New York City.

WIRELESS SETS AND APPARATUS
Radiomarine Corp. of America, 66 Broad St., New York City.

WORKBOATS
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.

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Thoroughly water-resisting

Permanently lubricated

Easy to handle and splice—wet or dry

Does not swell, harden or kink

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PAT'D AUG. 3, 1926. REG. U.S. PAT. OFF.

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THROUGH actual performance, discriminating rope buyers have become absolutely convinced that WATERFLEX is unquestionably

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Always remains flexible

Not affected by climatic changes

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For Ocean and Lake Trade

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BOLAND & CORNELIUS

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Write for free samples and quotations.

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Floorcrafters
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Kelvin & Wilfrid O. White Co.

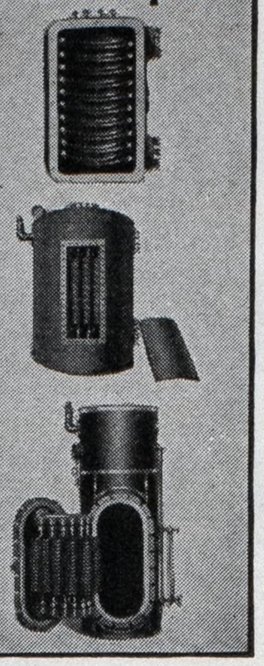
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Navigational Equipment
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New York and Montreal

Standard on the World's Greatest Ships

Paracoil
MARINE EQUIPMENT

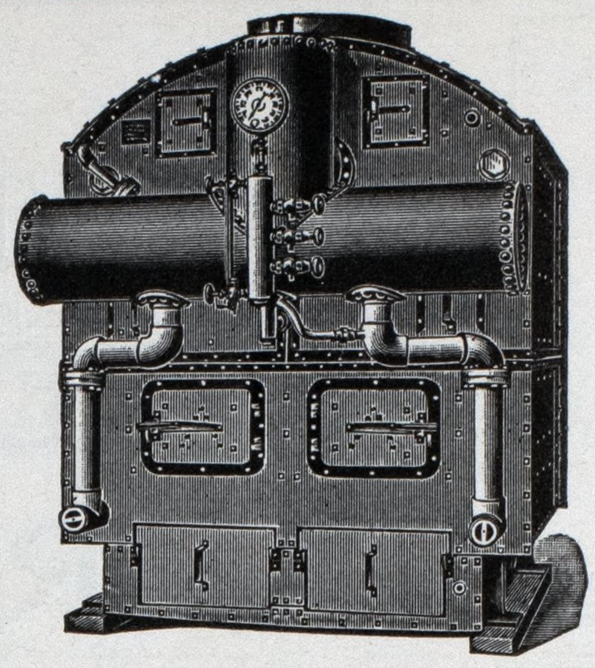


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Propeller Wheels and Blades
to fit any hub.
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Milwaukee, Wis.

Propeller Wheels, Marine Engines, Brass and Iron Castings. Large variety of Grate Bars in stock.

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(King Iron Works)
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Phone: Seneca 5361

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Self-Unloading Boats our Specialty ***Self Propelled and Self Unloading River Boats***
Wood and Steel Repair Work

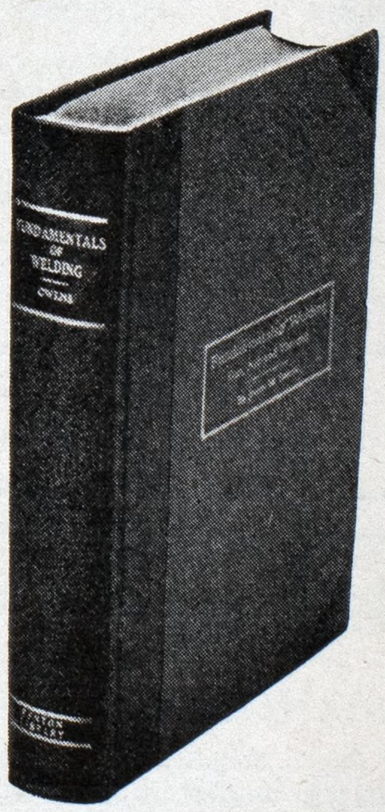
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The Gas Weld
The Arc Weld
Technic of the Arc Weld
The Thermit Weld
Gas and Arc Cutting
Metallography of the Weld
Residual Stress
Speed and Cost of Welding and Cutting
Choice of Methods
Design
Inspection and Tests
Production and Distribution of Oxygen Hydrogen and Acetylene
Arc Welding Generators and Transformers
Welding and Cutting Machines
Welding Rods, Electrodes and Fluxes
Protectors and Safety Precautions
Organization, Shop and School Layouts
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Practical Applications
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Penton Bldg., Lakeside Ave. & W. 3rd St. **Cleveland, O.**

230 I.F.D.

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Six words must be added for box address.

To insure insertion, advertisements must reach us by the 10th of the month.

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Position Wanted Advertisements
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Please have remittance accompany order.

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FOR SALE: TWO 140 H.P. SKANDIA DIESel engines for marine or stationary use. Address Box No. 405, care MARINE REVIEW, Cleveland.

Help Wanted

WANTED—YACHT CAPTAIN. EXPERIenced yachtsman laying keel for 80 foot yacht for use on Great Lakes, home port Milwaukee, in early fall, desires sober, experienced captain to begin employment year round at time building begins. Must have piloting ability and excellent record. Write giving full history and experience. Address Box 407, MARINE REVIEW, Cleveland, Ohio.

Wanted

WANTED—LEG BOILER 8 X 11—135 LB. Steam Pressure, U. S. Government Inspection. G. H. Breymann & Bros., 17 Battery Place, New York, N. Y.

For Sale

FOR SALE
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STEAM FISHING TUGS

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CLEVELAND, OHIO

FOR SALE: ONE LEATHEM D. SMITH self Unloading equipment complete for canal size steamer. Cowles-Lenahan Dry Dock, Inc., Buffalo, N. Y.

For Sale

FOR SALE; ONE 125 FT. WOODEN STEAM yacht, twin screw, two masts, mahogany cabins. Cowles Towing Co., Buffalo, N. Y.

FOR SALE. STEAMER ADVANCE. 175 FT. LONG. 35 FT. BEAM. COMPOSITE BUILT. CAPACITY 1200 TONS COAL. READY TO GO IN COMMISSION. W. BINGLEY & SON, WILLIAM ST., CORNWALL, ONTARIO.

FOR SALE—STEAM TUG 80′ X 22′ X 10′. Built 1919. New Boiler just installed.

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FOR SALE: MARINE ENGINES AND BOILers of all sizes, light draft, wooden and steel tug boats for sale or charter, derrick boats, deck scows and lighters for sale or charter. Cowles' Towing Co., Buffalo, N. Y.

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The classified section of MARINE REVIEW is for your convenience—its value is proving very worthwhile to everyone who uses it to buy and sell.

If you want to buy or sell ships or marine equipment—need a man for your organization—make it known to the entire marine industry through the use of classified advertising in MARINE REVIEW.

Mail copy for your advertisement in the August issue today, so it reaches us before July 20.

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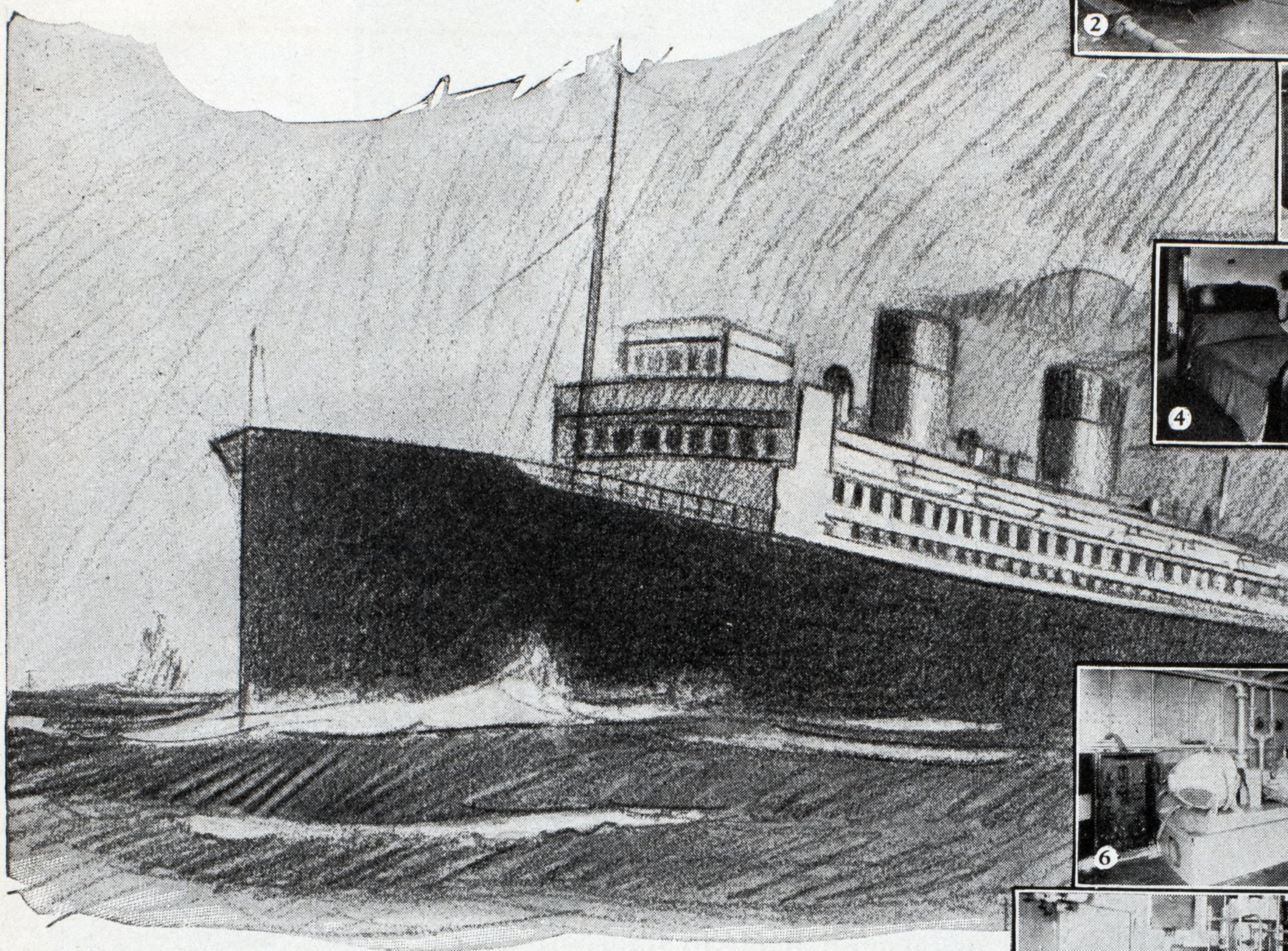
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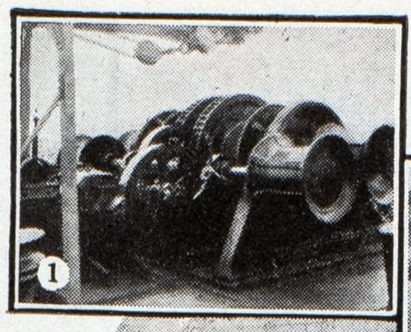
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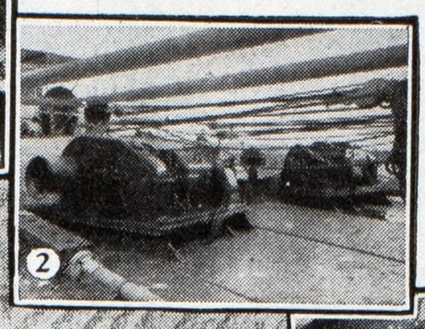
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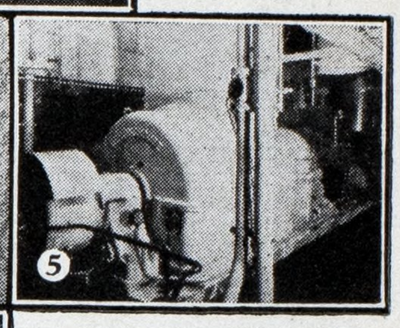


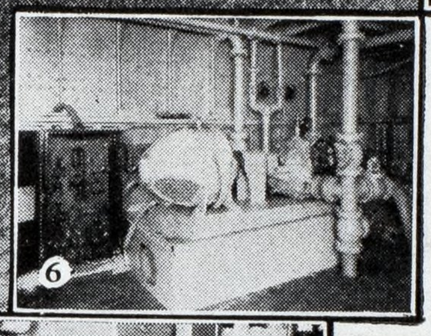


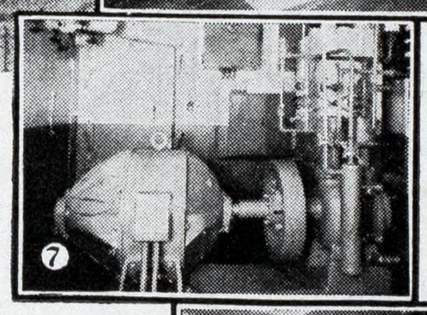


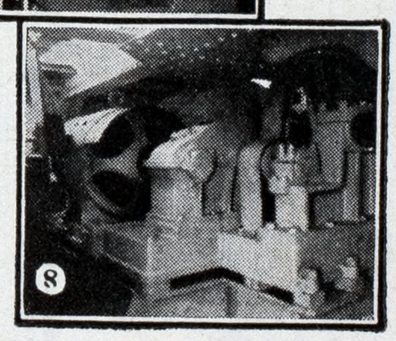












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3. Electric Galley Ranges
4. Cabin Equipped with Fan and Electric Heater
5. Main Generating Unit in Turbo-electric Engine Room
6. Motor-driven Pump
7. Motor-driven Ice Machine
8. Electrified Steering Gear

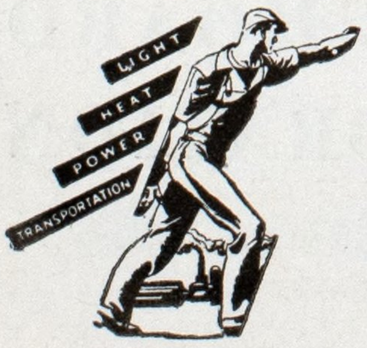
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DIXIE UK LINE
New Orleans, La.
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***AMERICAN PIONEER LINE**
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YANKEE LINE
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ORIOLE LINES
Citizens Natl. Bank Bldg., Baltimore, Md.
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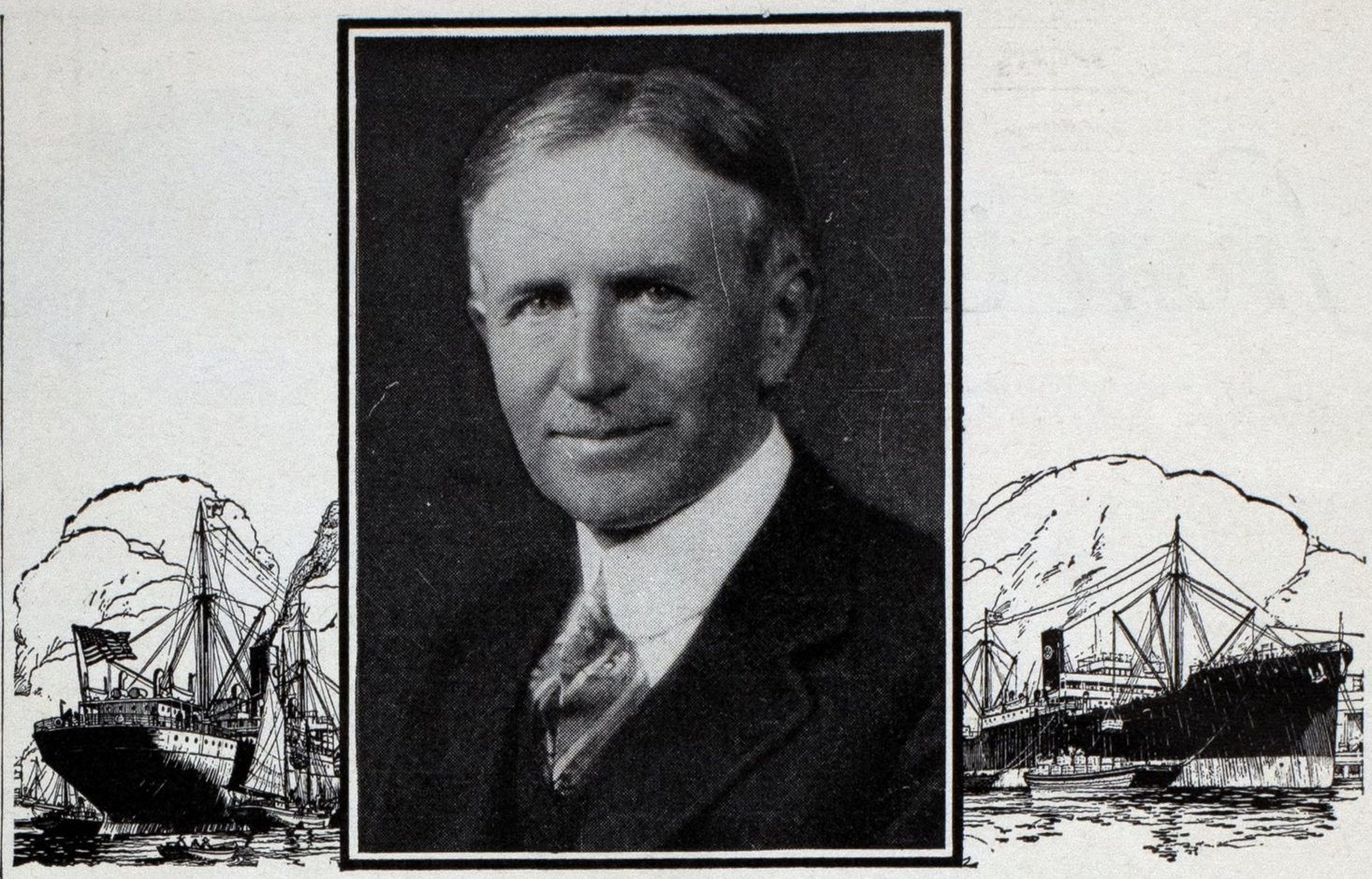
SOUTHERN STATES LINE
925 Whitney Central Building, New Orleans, La.
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TEXAS MEDITERRANEAN LINE
Cotton Exchange Bldg., Galveston, Tex.
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We can have a strong American Merchant Marine, only by using American Flag ships when, and wherever, it is possible to do so. Increased tonnage is necessary if we are to maintain an equilibrium of freight rates.

Without a strong American Merchant Marine, United States Shipping would be under the control of foreign interests and this would without a doubt seriously interfere with the nation's continued prosperity."

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In the Shipping Board fleet there are 18 lines, with a total of 245 vessels sailing regularly from Atlantic Coast and Gulf ports for ports in practically all parts of the world. Their operators will gladly consult with you on any problems pertaining to the handling of your overseas cargoes or the expansion of your foreign trade.

Write for complete information on freight or passenger services.

In addition to the services listed, eighteen American Flag lines developed and formerly controlled by the Shipping Board but now under private ownership, offer the same facilities for safe, dependable transportation.

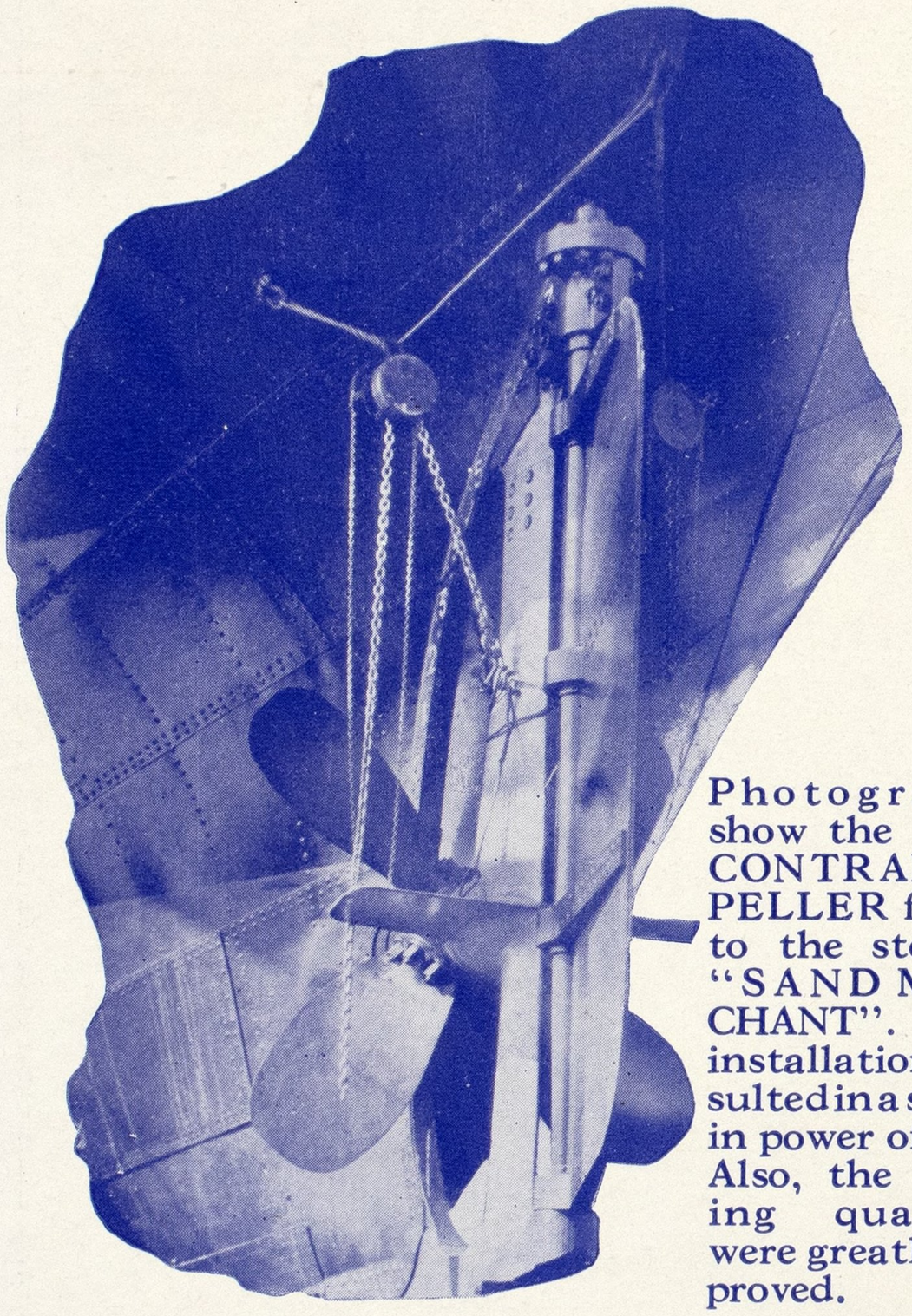
UNITED STATES SHIPPING BOARD MERCHANT FLEET CORPORATION

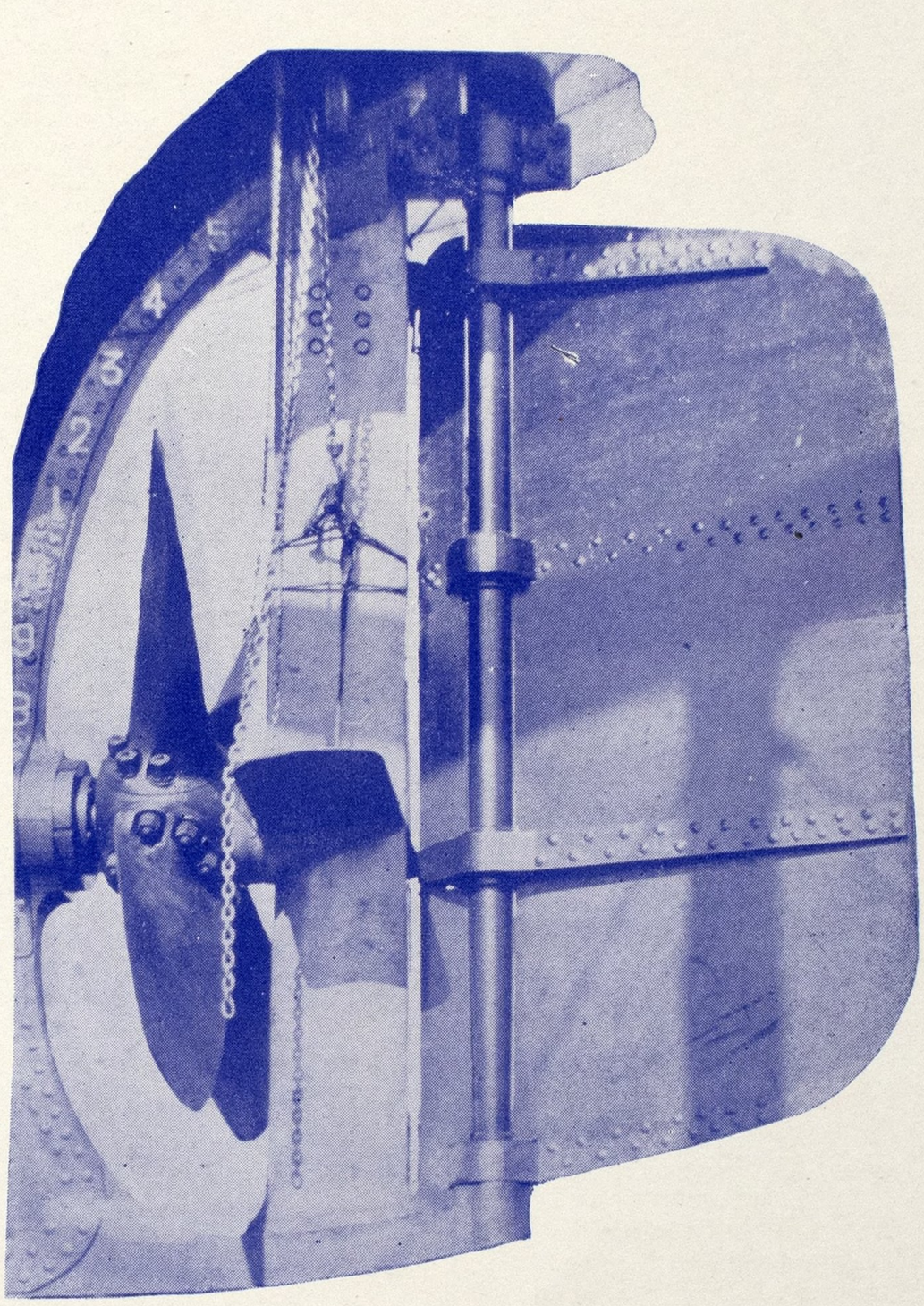
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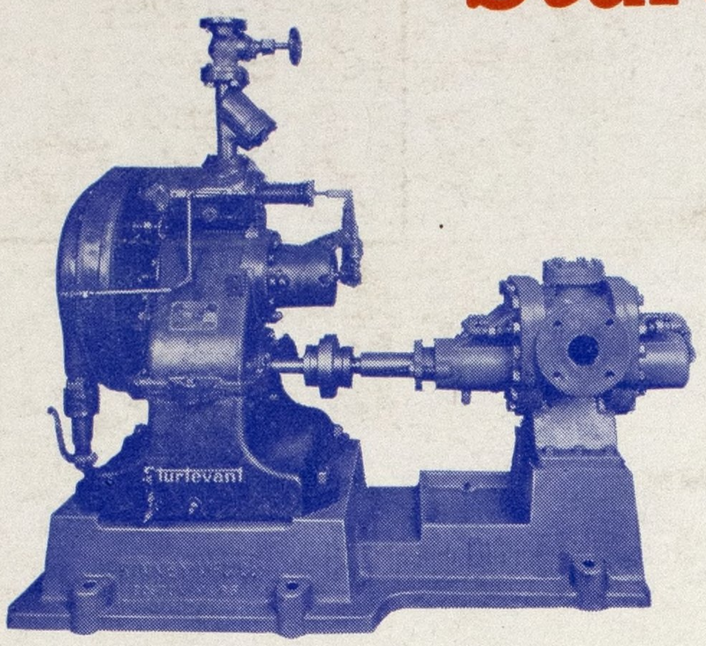
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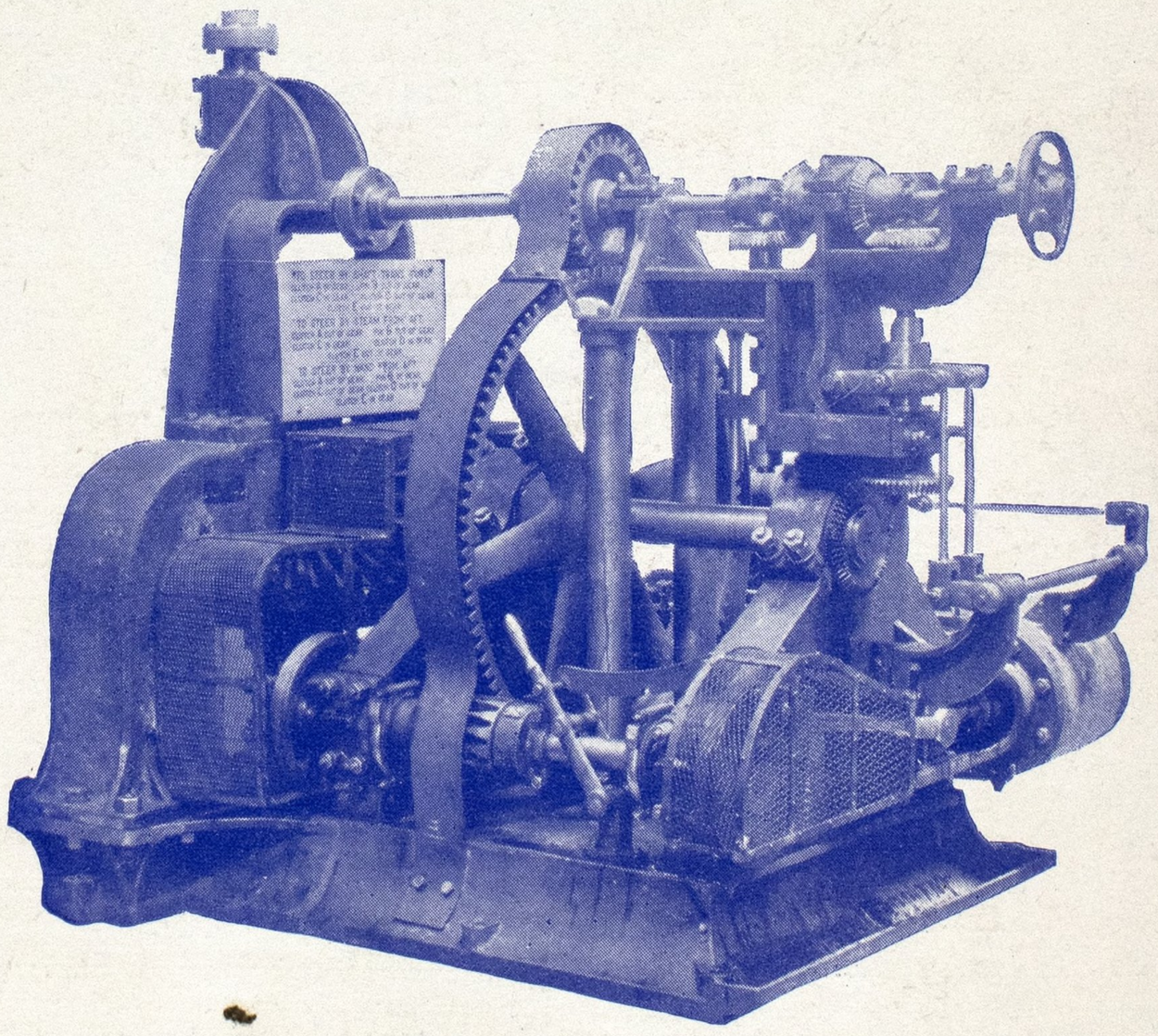
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